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Details of papers published in the journals other than UGC notified journals 2017

S. N	Publication type	Publication title	Author name	Journal name	Year
1.	Original article	Eighth nerve dysfunction in T2DM	Virgin JM, Rajendran R	International Journal of Medical Research & Review	2017
2.	Original article	Association between mean platelet volume &Microalbuminuria in T2DM patients	Virgin JM, K M Prabhuswamy	International Journal of Medical Research & Review	2017
3.	Original article	Effectiveness of social media as a medical teaching tool	Rajendran R, Virgin JM	International Journal of Medical Research & Review	2017
4.	Original article	A cross sectional study of correlation between serum uric acid level &microalbuminuria in T2DM patients	Prabhuswamy K M, Virgin Joena M.	International Archives of Integrated medicine	2017
5.	Original article	Estimation of Prolactin level in women with carcinoma breast	PSL Saravanan, S. Anu	Indian Journal of Clinical Anatomy and Physiology	2017
6.	Original article	Prolactin level in women with fibroadenoma breast- A Cross sectional study	PSL Saravanan, S. Anu	National Journal of Basic Medical Sciences	2017
7.	Original article	A Statistical Model to Predict Instantaneous Blood Pressure Using Velocity Measurements in the Radial Arteries	John Rajpathy Mariappan M Vijay Anto	Annals of International medical and Dental Research	2017
8.	Original article	EEG Spikes and Sharp Waves as a Guide to Anti-	Keba J John Rajpathy Jeyanthi A	Annals of International	2017

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		Epileptic Drug Therapy in Patients with Chronic Headache. A Retrospective Observational Analysis		medical and Dental Research	
9.	Original article	Assessment of Aerobic Power (Vo2 Max) in Different Group of Athletic Females in Relation with Body Mass Index and Hemoglobin.	Rekha K, Anu S, Antony Selvi S	National Journal of Basic Medical Sciences	2017
10.	Original article	Gender Differences on the Effect of Non-HDL-C on Blood Pressure, Blood Flow Velocities and Arterial Wall Thickness; An Observational Analysis in Madurai Population	John Rajpathy Mariappan M Vijay Anto	Annals of International Medical and Dental Research	2017
11.	Original article	Reduced stress tolerance in males? An animal model	Ethiya N Shanthi M Maheswaran	International Journal of Physiology	2017
12.	Original article	Comparison of visual reaction time in myopic subjects with emmetropic subjects	Saravanan M, Aravindan K	National Journal of Physiology, Pharmacy and Pharmacology	2017
13.	Original article	Accessory Mental Foramen-An Anatomical Variation of Mental Foramen in Human Mandibles	Parineeta Suman, Sabita Singh, Raj Kishore Mahato	National Journal of Basic Medical Sciences	2017
14.	Original article	Morphometric Analysis of Superior Articular Facets of Atlas	Parineeta Suman, Laxmi Chettangada	Journal of Evolution of Medical and Dental Sciences	2017

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		Vertebra and Its Clinical Applications	Cariappa and Raj Kishore Mahato		
15.	Original article	Prescribing pattern of antimicrobial agents in tertiary care center	Mohan. J Brahadeesh . M Vallish. B.N Raj Kishore Mahato	National Journal of Basic Medical Sciences	2017
16.	Original article	Analysis of Pharmacology Undergraduate Examination Patterns of Medical Universities of South India	J Mohan B N, Vallish M Brahadeesh, Raj Kishor	National Journal of Basic Medical Sciences	2017
17.	Original article	A modified transforaminal lumbar interbody fusion technique to decrease the incidence of postoperative radiculopathy : A prospective analysis of 216 patients	Subbiah M and Yegumuthu K	International Journal of Orthopaedics Sciences	2017
18.	Original article	Study on The Prevalence of Imipenam Resistant Acinetobacter Species in A aTertiary Care Hospital At Madurai.	Jhansi Charles, Rajendran,Vidhya , Ramesh	IOSR Journal of Dental and Medical Sciences	2017
19.	Original article	Clinicomicrobiological profile and antibiotic resistance analysis of Diabetic foot ulcer from a tertiary care hospital	Arunagiri R, Sundaramurthy R, Viswanathan A, Ganesan V, Thiruvannamalai R	Journal of evaluation of Medical and Dental sciences	2017
20.	Case Report	Acute Psychosis and Takayasu Vasculitis	Subramanian N, Shanmugasundaram P, Mariappan	International Journal of	2017

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			M and Ramanujam V	Medical Research &Health Sciences	
21.	Original article	Kimura's Disease in the West-Case Report and Review of literature	Nallasivan Subramanian, Amir Alvi and Yusuf Patel	Journal of Autoimmune Diseases and Rheumatology	2017
22.	Original article	Interleukin-6 blocker for successful outcome of late-onset rheumatoid oligoarthritis	Ravindran Y V, Nallasivan S	IP International Journal of Orthopaedic Rheumatology	2017
23.	Case Report	Acute Psychosis and Takayasu Vasculitis	Subramanian N, Shanmugasundaram P, Mariappan M and Ramanujam V	International Journal of Medical Research & Health Sciences	2017
24.	Review article	Clinical profile of urolithiasis among hospitalized children – a single center study	Jenish Rajma, Arun A.C., Mathevan Ganesapillai	International Journal of Pediatric Research	2017
25.	Original article	Clinical profile of children presenting with acute abdomen in a tertiary care centre of south Tamilnadu : a retrospective observational study	Jenish Rajma, Arun A. C., Jeyabalaji R. V., Natarajarathinam S., Mathevan G.	International Journal of Contemporary Pediatrics	2017
26.	Correspondence	Severe Complications of Mumps	Jenish Rajma and AC Arun	Indian Pediatrics	2017
27.	Original article	Approach to immunodeficiency disorders	Sridhurga Udayasankar	Journal of Paediatrics and Neonatal care	2017
28.	Original article	Study on Nasal Tip Projection of South Indian Population to derive Reference Values for Corrective Nasal Surgeries	Geetha K Siddapur, Kishan R Siddapur	An International Journal Clinical Rhinology	2017

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29.	Original article	A comparative study of Fentanyl and Clonidine as additives to plain Bupivacaine in caudal anaesthesia in children.	Malarvizhi T, Kannan K, Rajesh R, Poornima P.	International Journal of Medical Research and Review	2017
30.	Original article	A Statistical Model to Predict Instantaneous Blood Pressure Using Velocity Measurements in the Radial Arteries	John Rajpathy Mariappan M Vijay Anto	Annals of International medical and Dental Research	2017
31.	Original article	Computed Tomography Evaluation of Supratentorial Brain Tumours	Rajalakshmi Preethi, Mariappan M	Annals of International medical and Dental Research	2017
32.	Original article	The Role of Distraction Osteogenesis in Management of Temporomandibular Joint Ankylosis	R Yoganandha, A Thangavelu, S.R. Selva Kumar.	Clinical Dentistry	2017
33.	Original article	Temporalis myofascial flap in immediate reconstruction of maxillary defects	R. Yoganandha, A Thangavelu, Sachin Sinhar	International Journal of Contemporary Medicine	2017
34.	Original article	CBCT position of mental nerve relative to anatomical landmarks in South Indian population	Chenthil Aruun Mohan, R. Yoganandha, Deenadayalan Srinivasan, Sundaravel Subburaj	International Journal of Contemporary Medicine	2017

Original Research Article

Eighth Nerve Dysfunction in Type 2 Diabetes Mellitus

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Abstract

Introduction: Hearing impairment is one of the under-recognized complications of diabetes that affects the cognitive performance and quality of life. The study was conducted to estimate the prevalence of hearing impairment and analyze the type, degree and pattern of hearing impairment in diabetic population. **Materials and Methods:** The study was conducted as a case-control study including 50 diabetic patients and 20 healthy individuals after exclusion of confounding factors. Hearing assessment was done using pure tone audiometry. **Results:** The prevalence of hearing impairment in diabetics of age 35-65 years was 74% compared to normal population (15%). 7 out of 13 diabetic patients in the age group of 35-45, 19 out of 37 diabetics in the age group of 45-55 & 11 out of 13 diabetics in the age group of 55-65 had hearing impairment. 9 out of 12 diabetic patients having HbA1c of < 7 and 28 out of 38 diabetic patients having HbA1c of >7 had hearing impairment. 21 out of 27 patients with diabetes duration of <1 year, 6 out of 11 patients with diabetes duration of 1-5 years, and 10 out of 12 patients with diabetes duration >5years had hearing impairment. Out of 37 diabetic patients who had hearing impairment, 24 (64%) had diabetic neuropathy. **Conclusion:** Eighth nerve dysfunction is common among diabetics. Its prevalence among the diabetics increases with age and positively correlates with the duration of diabetes and presence of diabetic peripheral neuropathy. However, its prevalence did not show positive correlation with the HbA1c levels.

Keywords: Diabetes, HbA1c, Duration of Diabetes, Hearing impairment, Eighth nerve dysfunction, Neuropathy

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Introduction

Diabetes mellitus, a group of common metabolic disorders that share the phenotype of hyperglycemia, is becoming the epidemic of the 21st century. The prevalence of type 1 and type 2 diabetes mellitus is increasing worldwide and especially type 2 diabetes mellitus is rising more rapidly both in children and adults due to obesity and unhealthy life style. As a result of increasing incidence of diabetes mellitus, its complications also increase every year. Extensive studies are being done on its micro vascular and macro vascular complications. [1]. Hearing impairment is one of the under-recognized complications of diabetes. According to a comparative study of quality of life among elderly diabetic and non-diabetic patients, the progression of hearing loss was associated with worsening of indices of quality of life in both the groups. Screening, early identification, monitoring and rehabilitation of hearing impairment is important for improving the quality of life [2]. The presence of even minimal degree of hearing impairment affects the cognitive performance of elderly [3].

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Few studies have been done in Indian subcontinent on hearing loss in diabetes mellitus. So this study was focused on the incidence of hearing loss in diabetics and also to find whether the duration of diabetes or its glycemic control influence the severity of hearing loss.

Objectives of the Study

- To compare the auditory function of type 2 diabetes patients with non-diabetic individuals.
- To analyze the type, degree and pattern of hearing impairment among type 2 diabetes patients.

Materials and Methods

Study design: Case-control study.
Source of Data- Study population was classified into two groups. Group 1 comprises of 50type 2 diabetic patients of either sex selected from Department of General Medicine, belonging to the age between 35 and 60yrs. Group 2 comprises of 20 normal healty subjects of either sex selected from patient attendees in hospital belonging to the same age group.

Study Duration: November 2012 to August 2014.
Method of collection of Data.

The study comprising of 50 type2 diabetics and 20 non diabetics matched with respect to age and sex are selected based on inclusion and exclusion criteria

Inclusion criteria for diabetic patients: Type 2 diabetic patients between the ages 35 and 65 years

Exclusion criteria for cases:

- Hypertension
- History of consumption of ototoxic drugs in past three months.
- History of ear surgeries performed in the past.
- History of ear infections in the past.
- History of recent infections in the nose, throat or ear.
- Patients having a noise induced hearing loss (as shown by pure tone audiometry at 4000 Hz.)

Inclusion criteria for controls: Healthy subjects between 35 and 65 years. For the case population, before doing hearing assessment, age at onset of Diabetes Mellitus was noted to calculate the exact duration of diabetes of the patient. Previous history of hearing impairment, ear discharge, head or ear trauma and family history of congenital deafness were enquired. Diabetic neuropathy was clinically assessed by vibration test and sensation tested using mono-filament test.

The control population was selected after fulfilling the inclusion and exclusion criteria. The cases and controls were matched with respect to age and sex.

Then, clinical assessment of hearing was done in both cases and controls by doing Rinne's test, Weber's test and Absolute Bone Conduction test. Those who were able to understand and reciprocate the above clinical tests were subjected to undergo otoscopic examination and Pure tone audiometry using Amplaid 300 clinical audiometer. Pure tone audiometry was performed in a sound proof room for both cases and controls. Both air and bone conduction tests were performed at low, mid and high frequencies. Degree of hearing impairment was classified according to WHO classification [9].

The study was approved by the ethical committee of Velammal Medical college Hospital and Research Institute. The data was analyzed using SPSS software. Chi square tests has been used to find the significance of auditory thresholds (dB) between various categories of parameters. Analysis of variance (ANOVA) has been used to find the significance of auditory thresholds in different age groups and duration of diabetes.

Results

A total of fifty diabetic patients were screened. Out of which 32 were males and 18 were females. (Table 1). The mean age of the case population was 49.94 ± 6.57. The mean duration of diabetes was 2.64 yrs ± 3.32. The mean fasting glucose, mean post- prandial glucose and mean HbA1c were 170.4 mg/dl ± 63.34, 294.26 ± 87.7 mg/dl and 8.728 ± 1.95 respectively. In the diabetic patients, only 13 of them had normal hearing assessment.

Out of the 32 male diabetics, 25 had hearing loss whereas out of the 18 diabetic females, 12 had hearing loss. There was no statistically significant gender differences in the prevalence of hearing loss among diabetics (p value >0.05). (Table 1)

Table-1: Diabetic Population Characteristics.

Sex	Total	Hearing loss	Normal
Male	32	25	7
Female	18	12	6

Table-2: Prevalence of Hearing Loss in Diabetics and Controls.

Study Population	Hearing Loss Present		Hearing Loss Absent	
	n	%	n	%
Diabetic patients	37	74%	13	26%
Non diabetic persons	3	15%	17	85%

Table-3: Age wise characteristics of diabetic population with hearing impairment.

Age group (in years)	Mild	Moderate	Severe	Percentage of persons having hearing loss
35-45	7	0	0	53%
46-55	15	3	1	79%
55-65	7	3	1	84%

Table-4: Pattern and Severity of Hearing impairment in Diabetics.

Hearing loss severity	All frequency loss	Mid/high frequency loss
Mild (25-40 db)	25	5
Moderate (40-55 db)	1	1
Severe (>55 db)	4	1

In this study, 37 diabetic patients had hearing impairment. All cases of hearing impairment were of sensorineural type. Whereas only 3 of the healthy individuals had hearing impairment. (Table 2)

7 out of 13 diabetic patients in the age group of 35-45 years had hearing impairment. 19 out of 37 diabetic patients in the age group of 45-55 years had hearing impairment. 11 out of 13 diabetic patients in the age group of 55-65 years had hearing impairment. (Table 3)

In the 37 patients with deafness, 30 (81%) of them had hearing loss in all frequencies. And 7 (19%) had hearing loss only in the mid and high frequencies. (Table 4)

Out of 37 diabetics with hearing impairment, 30 (81%) of them had mild degree of hearing impairment, 2 (5.4%) had moderate hearing impairment and 5 (13%) had severe hearing impairment according to WHO classification. (Table 4)

12 diabetic patients had HbA1c of < 7. And among these 12 patients, 9 had hearing impairment. And among the 38 diabetic patients who had HbA1c of >7, 28 had hearing impairment. The metabolic control was not statistically significantly associated with the hearing loss ($p > 0.05$). (Table 5)

Table-5: Correlation of HbA1c and Hearing Impairment.

Severity of hearing impairment	HbA1c <7	HbA1c >7
Mild	7	23
Moderate	1	1
Severe	1	4
Normal	3	10

Table-6: Correlation of Duration of Diabetes and Hearing Impairment.

Duration of Diabetes	Total cases	Mild	Moderate	Severe
<1 year	27	15	2	4
1-5 years	11	6	0	0
>5 years	12	9	0	1

Table-7: Correlation of Neuropathy and Hearing Impairment.

Frequency of hearing loss	Neuropathy present	Neuropathy absent
All frequency	22	8
Mid/high	2	5
Normal	2	11

Out of 37 diabetic patients with hearing impairment, 27 patients had diabetes duration of less than 1 year, 11 patients had diabetes duration of 1-5 years and 12 patients had diabetes duration of 5 years. In the patients with diabetes duration of less than one year (27), 21 had hearing impairment. Out of them 15 had mild hearing impairment, 2 had moderate hearing impairment and 4 had severe hearing impairment. In the group of patients with diabetes duration of 1-5 years (11), 6 had mild hearing impairment. Among patients with duration of diabetes above 5yrs (12), 10 had hearing impairment with 9 having mild hearing impairment and 1 having severe hearing impairment. Duration of diabetes positively correlated with hearing loss (p=0.001) when analyzed by one way ANOVA (Table 6)

Among the 50 diabetic patients, 23 patients were recently diagnosed to have diabetes mellitus. Out of these 23 patients, 17 (69.56%) of them had hearing loss at the presentation.

Out of 50 diabetic patients, 26 had diabetic neuropathy and 24 had no evidence of neuropathy. Out of 37 diabetic patients who had hearing impairment, 24 (64%) had neuropathy and 13 (36%) had no evidence of neuropathy. p value < 0.05 (Table 7)

Discussion

The prevalence of hearing impairment in diabetes mellitus population of age 35 - 65 years was 74% when compared to the age and gender matched non diabetic population where it was only 15% (p value: 0.001). Thus, hearing important is more prevalent among the diabetic population compared to the healthy individuals. The prevalence of hearing impairment in diabetes mellitus population has been 0 to 93% in various other studies [3,4].

The probable mechanisms proposed are micro-angiopathy of the inner ear, neuropathy of the cochlear nerve or a combination of the both. Elamin et al [10] favours microangiopathic theory, which is supported by histopathological findings on the temporal bones and inner ear. Thickening of capillary wall with secondary ischemia in the cochlea and the 8th cranial nerve have been documented in diabetic patients and experimental animal models by Durmus et al 1980 [11]. This study demonstrates a significant hearing loss in diabetics in all the frequencies tested. This could be explained by microangiopathy of the vessels to the inner ear as proposed by Wackym [12] or due to the chronic nature of the disease as explained by De Espana [6]. The effect of age on auditory thresholds in diabetic subjects was found to be clinically and statistically significant. Higher the age, more was the prevalence of hearing impairment. This was similar to the results of De Espana (1995).

He found a correlation between hearing levels and age of the subjects in the diabetic group [6] and concluded that any hearing loss due to diabetes will be additional to that due to age alone. Similar conclusions were drawn by Axelson [13]. These results were not similar to Kakarlupudi [14] and Dalton [15] studies. There also few studies to suggest that persons with diabetes may experience hearing loss at earlier ages. There were no statistically significant gender differences in the prevalence of hearing loss among diabetics.

Duration of diabetes did correlate with the prevalence of hearing impairment among diabetics similar to the study by Tay et al [7]. Among the 50 diabetic patients, 23 patients were recently diagnosed to have diabetes mellitus. Out of these 23 patients, 17 (69.56%) of them had hearing loss at the presentation. Thus recognition of the disease in our population is generally late i.e., only after the development of microangiopathic complications.

Hearing impairment was not significantly associated with the level of HbA1c (p value:>0.05). This was similar to the results by Weng et al (2005). [8]. There was also no correlation with blood sugar levels similar to results of Durmus [11].

The hearing impairment was strongly associated with the presence of diabetic neuropathy. Frequency of hearing loss can be of any type depending upon the site of dysfunction. The low frequency hearing loss arises from lesion of retrocochlear auditory nerve. The high frequency hearing loss arises from cochlear outer hair cells. [16] In the 37 patients with deafness, 30 (81%) of them had hearing loss in all frequencies. And 7 (19%) had hearing loss only in the mid and high frequencies. This study shows the hearing impairment is predominantly because of auditory neuropathy.

The incidence of hearing impairment is as high as 75% in our population. It is usually under recognized. With such high proportions of hearing loss, health care providers should consider providing referrals for early audiometric testing. Audiologists seeing middle aged patients with unexplained hearing loss must also enquire about the history of diabetes and family history of diabetes.

Early recognition of the diabetes and its complications is important. And all the newly diagnosed patients should be periodically screened for its complications. Patients with diabetes should be encouraged in their efforts to maintain good and early control of blood glucose thereby preventing the early complication of oxidative stress.

There should be development of therapy that targets signaling pathways that cause vascular dysfunction in spite of controlling blood sugar levels. People with damaged ears should be recognized early and rehabilitated early with hearing aids thereby improving their quality of life.

Conclusion

Eighth Nerve dysfunction is very common among diabetic population compared to healthy individuals, which is frequently under-recognized, impairing the quality of life. Its prevalence among the diabetics increases as age advances. and also it positively correlates with the duration of diabetes and the presence of diabetic peripheral neuropathy. However, its prevalence did not show positive correlation with the HbA1c levels.

Therefore, eighth nerve dysfunction should be actively pursued in all diabetics and early rehabilitative measures should be instituted for improvement of their quality of life.

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Permission of IRB: Yes

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Original Research Article

Association between mean platelet volume and Microalbuminuria in Type 2 Diabetes Mellitus Patients

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Abstract

Background: Type 2 DM is characterized by increased platelets activation, hence platelet functional markers like the mean platelet volume (MPV) can play a vital role in identifying subjects at high risk of developing microvascular complications. **Objectives:** To study the association between mean platelet volume and micro albuminuria and to analyse factors associated with MPV in patients with Type 2 diabetes mellitus. **Materials & Methods:** A cross sectional study was conducted in the department of internal medicine, Velammal medical college and hospital, between June 2016 and December 2016. Subjects with DM, with age > 20 years were included. Latex Turbidimetric method was used to assess urine micro albumin. **Results:** A total of 269 diabetic patients with mean duration of disease of 4.84 years were included. There was a moderate, statistically significant positive correlation between HbA1 C level and Mean platelet volume (PCC=-0.198, p value 0.001). The other factors had shown no statistically significant correlation with MPV. There was a Statistically significant mild negative correlation between serum uric acid and MPV (PCC= -0.196, p value 0.001). The mean MPV in people with low and high Urine micro albumin was 7.716 ± 0.876 and 7.705 ± 0.890 respectively, and the difference was statistically not significant. **Concussions:** Poor glycaemic control may lead to higher MPV in diabetic population. Very minimal and statistically non-significant difference was observed in mean MPV value between subjects with high micro albuminuria and low micro albuminuria.

Key words: Type 2 DM, Mean Platelet Volume, Micro albuminuria

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Introduction

Type 2 Diabetes mellitus (DM) is a complex metabolic disorder that has shown a steep rise in its global prevalence from 4.7% in 1980 to 8.5% in 2014 where in number of people affected was 108 million and 422 million respectively [1], a serious public health problem. Additionally, nearly one-third of individuals with type 2 DM are undiagnosed.

Also type 2 DM is characterized by increased platelets activation and coagulation proteins and diminished fibrinolytic activity [2]. This change in platelet activity is linked to the microvascular complications associated with Type 2 DM like retinopathy, nephropathy and neuropathy [3,4]. Platelets have a vital role in physiological hemostasis and their optimal function is determined by markers like the mean platelet volume (MPV) and platelet size. The risk of thrombosis is high when there is increase in the platelet size and the consequent increase in MPV as the platelets are more reactive hemostatically thereby producing higher quantities of prothrombotic factor and thromboxane A2 [5]. Increased MPV seems to be associated with type 2 Diabetes mellitus [6] and also in diabetics, two prospective cohort studies have shown a positive relation between MPV and cardiovascular disease (CVD) [7] and all-cause mortality [8].

Microalbuminuria is considered to be the best predictor of development of nephropathy affecting 20-40% of

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patients with type 2 DM [9]. It also strongly predicts the risk CVD independent from traditional (e.g., smoking, hyperlipidemia, hypertension) and non-traditional (e.g., C-reactive protein) risk factors [10,11]. Micro-albuminuria also seems to be an indicator of microangiopathy in diabetics [12].

There is scarcity of literature even in India regarding the relation between mean platelet volume and microalbuminuria, hence the present study aims to assess the same in diabetic patients.

Aims & Objectives

- To study the association between mean platelet volume and micro albuminuria in patients with Type 2 diabetes mellitus
- To assess the factors associated with mean platelet volume in patieints with Type 2 Diabetes mellitus

Materials and methods

Study design: The current study is a cross sectional study.

Study setting: The study was conducted in the department of internal medicine, Velammal medical college and hospital

Study duration: The study was conducted between June 2016 and December 2016

Study population: All the known and newly diagnosed cases of diabetes mellitus were included in the study

Inclusion criteria

1. Aged above 20 years
2. Both male & female

Exclusion criteria

1. Elevated renal parameters and gout

Ethical issues: The study has been approved by institutional human ethics committee. After obtaining informed written consent for each participant, thorough history was obtained regarding the duration of diabetes, treatment, glycaemic control and occurrence of any complications.

5 ml of venous blood was drawn with aseptic precautions and all relevant parameters like Hba1c, platelet related parameters and renal parameters were assessed.

Direct Enzymatic Assay method and Latex Turbidimetric method were used respectively to assess serum uric acid and urine micro albumin.

Statistical methods: Urine micro albumin was considered as the primary outcome variable. Mean platelet volume was considered as primary explanatory variable.

Duration of diabetes mellitus, age of the patient, glycemic control as assessed by Hba1C levels, lipid profile parameters were considered as explanatory variables.

Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables.

Data was also represented using appropriate diagrams like bar diagram, pie diagram and box plots.

Association between quantitative explanatory and outcome variables was assessed by calculating pearson correlation coefficient and the data was represented in a scatter diagram. P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis [13].

Observations & Results

Final analysis has included 269 patients. The mean age was 54.29 ±11.23 years and male to female ratio was 2.84. Majority (60.59%) of the study subjects were known diabetics.

The mean duration of diabetes was 4.85 years. Known hypertensive constituted 29% and another 14.87% were recently diagnosed with hypertension. The mean HbA1c level in study population was 7.53 %. The mean values of lipid profile parameters, blood urea and serum creatinine were within normal physiological limits.

The mean serum uric acid level was 4.95±1.48 and the mean urinine micro albumin level was 34.56± 71.39 in study population. The mean platelet volume level was 7.71 ± 0.87 in study population (table 1)

Table-1: Descriptive analysis of socio demographic parameters in study group (N=269).

Parameter	Summary
Age (mean ±SD)	54.297 ± 11.23
Male : Female Ratio	2.84:1
Duration of diabetes (mean ±SD)	4.845 ± 6.51
Diabetes History	
• Known Case	163(60.59%)
• Recently Diagnosed	106(39.41%)
Hypertension	
• Known Case	78 (29%)
• Recently Diagnosed	40(14.87%)
HbA1c	7.536 ± 1.843
Blood Urea	22.28 ± 7.544
Serum Creatinine	0.805 ± 0.225
Uric Acid	4.955 ± 1.482
Urine Micro albumin	34.56 ± 71.39
Mean Platelet Volume	7.71 ± 0.87

Table-2: Correlation between various diabetes related parameters and Mean Platelet Volume in study group

parameter	Pearson Correlation Coefficient (PCC)	P value
Age	-0.048	0.431
Duration of diabetes	-0.007	0.915
HbA1c	0.198	***0.001***
Total Cholesterol	-0.069	0.263
HDL	-0.073	0.232
LDL	-0.053	0.382
TGL	-0.011	0.852
Blood Urea	0.026	0.676
Serum uric acid	-0.196	0.001

There was a moderate, statistically significant positive correlation between HbA1 C level and Mean platelet volume in the study group (PCC=-0.198, p value 0.001). The other factors had shown no statistically significant correlation with Mean Platelet volume in the study group. There was a statistically significant mild negative correlation between serum uric acid and MPV (PCC= -0.196, p value 0.001). (Table 2)

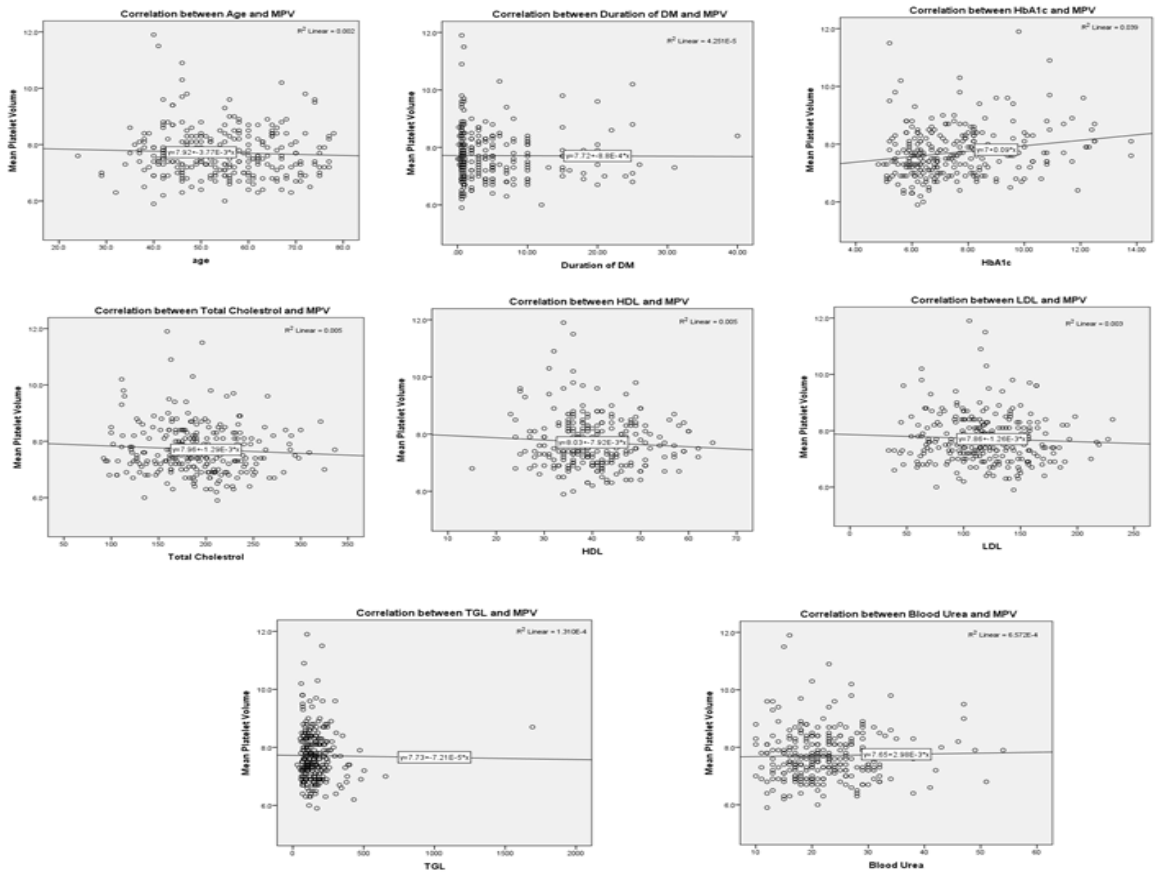

Figure-1: Correlation between various diabetes related parameters and Mean Platelet Volume

Table-3: Association between duration of diabetes and MPV in study group (N=269)

Duration of Diabetes	MPV Mean ± Std. Dev	Mean difference	95% Confidence Interval for Mean		P value
			Lower Bound	Upper Bound	
< 5	7.722 ± 0.882				
6 to 10	7.663 ± 0.831	0.059	-0.31	0.435	1.00
> 11	7.718 ± 0.929	0.003	-0.40	0.408	1.00

The mean MPV in people with duration of diabetes < 5 years was 7.722 ± 0.882, 6 to 10 years was 7.663 ± 0.831 and > 11 years was 7.718 ± 0.929 in study population. There was no statistically significant association between duration of diabetes mellitus and mean platelet volume in study group. (Table 3)

Table-4: Association between Urine micro albumin and Mean Platelet Volume (N=269)

Urine Micro albumin	Mean Platelet Volume Mean ± STD	Mean difference	95% CI		P value
			Lower	Upper	
Low (up to 29.99)	7.716 ± 0.876	0.01	-0.22990	0.25163	.914
High (30 and above)	7.705 ± 0.890				

The mean MPV in people with low Urine micro albumin was 7.716 ± 0.876 and in people with high urine micro albumin was 7.705 ± 0.890. There was no statistically significant association between urine micro albumin and mean platelet volume in study group. (Table 4).

Discussion

The vascular complications in DM patients pose higher risk of morbidity and mortality. Patients with type 2 DM usually develop early interruption of endothelial functions, hyper-activation of platelets and progressive atherosclerosis [14]. This is one of the suggested mechanisms of atherosclerosis among diabetics. Increased platelet reactivity leads to enhanced platelet volume [15] due to altered platelet size and density. MPV refers to the average of the size of the platelets in the blood [16].

The MPV and platelet counts are not only indicators of thrombotic potential, but also risk factors for microvascular complications in diabetics [17-19]. Such platelets synthesize more thromboxane A2, are able to aggregate better, and are able to secrete more serotonin and β- thromboglobulin than regular platelets [20, 21]. The most recent systematic review concluded that the annual incidence of microalbuminuria is higher among patients with type 2 DM (~ 8%) than those with type 1 (~ 2–3%) [22].

The mean age of the study participants was 54.29 ±11.23 years and the mean duration of diabetes was 4.85 ± 6.51 years This was in contrast to study done by Papanas N et al., [23] who reported their mean age of the diabetics as 67.4 ± 9.5 years and a mean diabetes duration of 14.5 ± 5.7 years. However, Hasan Z et al., [24] found their patients diabetes duration as 4 ± 5.6 years which was similar to our study. Among the total, 60.59% were known cases of diabetes and remaining 39.41% were diagnosed recently (< 1 year).

Prolonged hyperglycemia leads to a series of interconnected changes leading to endothelial dysfunction and vascular injuries resulting in further complications in diabetics [25]. Some of the proposed mechanisms include; synthesis of advanced glycation end products, protein kinase C activation and disruption of polyol pathways [24].

There was a moderate, statistically significant positive correlation between HbA1 C level and Mean platelet volume in the study group (r=-0.198, p value 0.001). In comparison Hasan Z et al., [24] reported a slightly lesser and non significant correlation (r=0.115). Contrastingly the studies by Hasan Z et al., [24] and Yenigün EC et al., [26] reported no association between MPV and HbA1 C.

There was no statistically significant association between duration of diabetes mellitus and mean platelet volume in study group. This finding is in concurrence with that of Hasan Z et al., [24]. In their study, Kodiatte et al., found a significant correlation between MPV and duration of DM [27]. However, Zuberi et al., [28] reported that patients with longer duration of DM had high prevalence of microvascular complications. Also there was no statistically significant association between urine micro albumin and mean platelet volume in study group.

To minimize the impact of the complications in DM patients as they increase day by day, an approach to modify the risk factors is necessary.

Regarding the limitations of our study, the lack of controls and a relatively smaller sample might lessen the significance of the findings observed in the study population. Also assessing the patietns from a single institution might limit the generalizability of the study findings.

Conclusions

1. The mean MPV had shown a significant positive correlation with HbA1C levels in study population. Hence poor glycaemic control may lead to higher MPV in diabetic population
2. Duration of diabetes mellitus had shown no statistically significant association with MPV in the study population.
3. Very minimal and statistically non-significant difference was observed in mean MPV value between subjects with high microalbuminuria and low micro albuminuria.

Recommendations: Further large scale studies on the subject with higher sample size may provide us better understanding of role of MPV as an early marker of subsequent development of micro and macro vascular complications of diabetes.

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Original Research Article

Effectiveness of social media as a medical teaching tool

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Abstract

Introduction: Social media has become a pervasive force in the lives of 21st century learners. Mobile learning has been increasingly used in the educational context. However, its adoption in medical education has been slow, and its effectiveness in medical education is a new area of inquiry. This study was conceived to assess the effectiveness of social media as a medical teaching tool. **Materials and Methods:** The study was conducted as a cross sectional, observational study with 150 III year MBBS students as study participants who were already enrolled in social network groups for educational purpose. A questionnaire catering to the objectives of the study was distributed and the response was evaluated. **Results:** 54% of the students answered that social media as a teaching tool, significantly made learning fun and lively. 55% of students responded that it significantly improved the academic enthusiasm. 66% of students observed that it was significantly effective in kindling interest in clinical learning. 61% felt that it simplified the difficult concepts moderately and 28% felt that it significantly simplified difficult concepts. 60% of students felt that it did not distract them from their routine studies. 42% and 54% of students rated the usefulness of the social media as an educational tool as excellent and as moderate respectively. **Conclusion:** Social media is effective as a medical teaching tool improving enthusiasm in academics, kindling interest in clinical learning, making learning fun and lively, without much distraction to students and can be integrated in the medical educational context.

Keywords: Social media, Teaching tool**,** Academics, Interest, Distraction, Effectiveness

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Introduction

Social networking among adolescents is not just a fad; it is part of their culture. Social media is the in-thing these days [1]. Currently, social networks are used for a variety of purposes, such as chatting, socializing, posting, and most interestingly, learning [2,3]. Social media has become a pervasive force in the lives of 21st century learners [4]. Mobile learning has been increasingly used in the educational context [5]. Social media as a teaching tool has a natural collaborative element [1].

Social and communicative connections has been elevated to the level of an epistemic category central to learning processes because they promote connectivist learning by sharing of information, active participation and social interaction [6,7]. Students appreciate the contribution of social media network to their own personal learning experience [8]. Students also look out for more innovative ways of teaching [4]. Students wish their educators make more use of social media [9].

However, the higher educational community has been noticeably slow in adopting social networking technologies into the curriculum [10]. The use of social media holds great value as a teaching and learning tool in medical education, by including students in the creation of their own knowledge and by facilitating engagement, self-reflection and active learning [11]. Studies have shown the merits of social media use in educational settings; however, its adoption in health science education has been sluggish, and the contributing reasons remain unclear [12]. Its effectiveness in medical education is a new area of enquiry [13]. There is controversy about whether to use

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social networking in medical education [14]. Therefore this study was conceived to assess the effectiveness of social media as a medical teaching tool.

Objective of the study: To assess the effectiveness of social media as a medical teaching tool

Materials and Methods

Study Design: Cross sectional, observational study

Study setting: Velammal Medical College

Inclusion criteria: Undergraduate medical students enrolled in social media network used for educational purpose

Exclusion criteria: Undergraduate medical students not enrolled in social media network used for educational purpose

Study participants: III year students of a medical college enrolled in social media network for educational purpose.

Study size: 130 students

Variables: Age group of students:19-20; 52 boys and 72 girls.

Data source: Self administered questionnaire paper with Likert scale grading

Bias: Possible selection bias. Students inherently more motivated to study and those who are comfortable with social media and those who prefer to learn in a group may be the ones who enrolled into social media and it is likely that they would give positive ratings to its usefulness.

The Department of General Medicine, Velammal Medical College, with the permission of administration, is using social media like facebook, whatsapp as a platform for sharing and discussing interesting clinical materials, with General Medicine faculties and medical students forming a closed group network. The facebook group is mainly used to post interesting case puzzles, clinical pictures, radiological images, ECGs, unusual laboratory values, quizzes followed by a short relevant discussion with critiques and comments from faculties and students on the particular subject. Whatsapp group is manly used for intimating interesting clinical cases in the wards and their findings with the purpose that students could examine those cases in their leisure time and be appreciative of the wide spectrum of the diseases. The social media network groups have been functioning for more than 1 year regularly.

In order to assess the effectiveness of social media in the learning environment of the students, a preformed printed feedback questionnaire catering to the objectives of the study was distributed to 130 students who were enrolled in the social media group. The students belonged to the III year MBBS. They were in the age group of 19-20. There were 52 boys and 78 girls. The participation in this study was anonymous to the identity of the students. Participation was voluntary.

The parameters tested were the effectiveness in making difficult concepts simple, making learning fun & lively, in improving enthusiasm in academics, in kindling interest in clinical learning. Also questions were asked as whether it caused distraction from their routine studies, about its overall usefulness and also about the constancy of usage. Institutional ethical committee clearance was obtained. The feedback forms were collected and the data were electronically recorded and their response to various parameters was analyzed.

Results

A total of 130 students participated in the study. It included 52 boys and 78 girls.
70/130 (54%) students answered that the social media used as a teaching tool significantly made learning fun and lively. 48/130 (37%) students considered it to make learning fun and lively moderately. 12/130 (9%) students answered that it could not make learning fun and lively. 72/130 (55%) students responded that social media education significantly improved the enthusiasm in academics, whereas 50/130 (39%) students responded that it moderately improved the academic enthusiasm. 8/130 (6%) students responded that it did not improve the enthusiasm in academics.

86/130 (66%) students observed that the social media was significantly effective in kindling interest in clinical learning and 35/130 (27%) students observed that the social media was moderately effective in kindling interest in clinical learning and 9/130 (7%) observed that it did not kindle interest in clinical learning. 36/130 (28%) students felt that the social media as a medical teaching tool was significantly effective in simplifying difficult concepts, whereas 79/130 (61%) students felt that it was moderately effective in simplifying the difficult concepts. 15/130 (11%) students perceived that it could not simplify difficult concepts.

78/130 (60%) students felt when social media is used as a medical teaching tool, it did not distract them from their routine studies. 40/130 (31%) students felt it distracted them from their routine studies moderately and 12/130 (9%) students felt it significantly distracted them from their routine studies.

55/130 (42%) students rated the usefulness of the social media as an educational tool, as excellent and 73/130 (56%) students rated the usefulness as moderate and 2/130 (2%) students rated it as not useful.

56/130 (43%) students answered that they would be using the social media for educational purposes regularly and 69/130 (53%) students answered they would use it discontinuously and 5/130 (4%) answered they would not be using it.

Table-1: Response to different questions.

Parameter assessed	**Number of responders (percentage in parentheses)**		
Question	**Significantly**	**Moderately**	**No**
Whether it makes learning fun and lively?	70 (54%)	48 (37%)	12 (9%)
Whether it improves your enthusiasm in academics?	72 (55%)	50 (39%)	8 (6%)
Whether it kindles interest in clinical learning?	86 (66%)	35 (27%)	9 (7%)
Whether it makes difficult concepts simple?	36 (28%)	79 (61%)	15 (11%)
Whether it distracts your routine studies?	78 (60%)	40 (31%)	12 (9%)
Question	Excellent	Moderate	Not useful
How will you rate its usefulness?	55 (42%)	73 (56%)	2 (2%)
Question	Regularly	Discontinuously	Not be using
How often will you be using it?	56 (43%)	69 (53%)	5 (4%)

Discussion

Social media these days is being used by youth for making their individuality felt on the virtual world. However, it can also be used for creating social awareness and connecting students and youth to more professional and knowledgeable world [1].

Medical education has grown beyond the boundaries of the classroom, and social media is seen as the bridge between informal and formal learning as it keeps students highly engaged with educational content outside the classroom [14]. It also allows them to communicate with their tutors without any restriction and thereby strengthening student-tutor relationship [18,19]. This type of learning is characterized not only by greater autonomy for the learner but also by changing roles for the teacher; indeed, a collapse of the distinction between teacher and student altogether is perceived, indicative of connectivist learning [6].

Based on the results of the study, the following conclusions can be drawn. When used as a medical teaching tool it significantly made learning fun and lively for a majority of the students. Social media education can be used to generate enthusiasm in academics among medical students as evidenced by majority of students strongly agreeing that it improved the enthusiasm significantly. Education through social media is also effective in kindling interest in learning clinical aspects of a case as majority felt it significantly helped them in kindling interest in clinical learning.

Further, social media learning is warmly accepted by majority of the medical students as majority of them responded that they will be continuing to use it in future. Discontinuous use of social media by few students was probably because of their busy schedule. Apprehension regarding distraction arising out of social media use as a medical teaching tool is probably overestimated as majority of students did not feel that they were distracted.

The efficacy of social media in simplifying difficult concepts was only moderate and this is understandable because social media cannot be the best platform for explaining difficult concepts as it has intrinsic barriers for effective communication. The rating of the overall usefulness of social media as moderate according to majority, could be attributed to the multitude of other educational modalities also playing their part in simplifying medical learning. The results of our study is

similar to the results published in various studies. In a study by El Bialy, Jalali A, conducted at the medical University of Ottawa, it was observed that most educators did not use social media in their education. They expressed concerns such as privacy issues, time-wasting, distraction, and that these media might not be suitable for education. Some educators were unaware of social media use in education. The educators those who used social media, used it to post articles, explanatory comments, and videos, post lecture comments, book recommendations, revision files, quizzes, and course related humor. Those who refused to use social media in education, expressed concerns such as privacy issues, time-wasting, distraction, and that these media might not be suitable for education [14].

In that study by El Bialy, Jalali A., majority of students considered social media to be time effective, inviting, and an improvement in the learning experience similar to our study. Students preferred quizzes, revision files and explanatory comments [14]. In a study by Alsuraihi AK et al., conducted among medical universities in Saudi Arabia, 95.8% of the students believed that it is beneficial, while 40% thought using social media might be distracting [15].

A pilot study by George et al., conducted at the Penn State College of Medicine evaluated the integration of Twitter, YouTube, Flicker, Blogging, and Skype in two elective courses for fourth year medical students. The results of this study showed that students were satisfied by the new approach in both courses. They also expressed the extent to which the integration of social media in teaching enhanced their learning similar to our study. However, some students reported challenges such as lack of time and technological facilities. This may be a cause for a high proportion of discontinuous use of social media rather than its regular use as an educational tool which was also was reflected in our study [17]. In a study by Avci K et al., conducted at the Afyon Kocatepe University, Faculty of Medicine, Afyonkarahisar, Turkey that evaluated twitter as a teaching tool, it was found that students believed it to be efficient and effective to their learning as was found in our study. It also strengthened student-tutor relationship [18].

Social media has been incorporated in several medical colleges and it has also been recommended that social media be integrated in the medical educational curricula [11,16]. 132 of all U.S. medical schools have a website and 95% of them have some facebook presence. Out of these schools, 26% have official medical school SM pages and 71% have student groups [20]. Ozkan and McKenzie in their paper, Social Networking Tools for Teacher Education, in *Proceedings of Society for Information Technology & Teacher Education International Conference,* 2008 contend that educators need to engage students with a more 21st century approach to teaching and social networking technologies can provide such a venue [21].

This study also concludes the same as it is effective in improving enthusiasm in academics, kindling interest in clinical learning, making learning fun and lively, without much distraction to students. Despite all the criticism, social media have the potential to build interactivity, engagement, and collaboration. It will remain the responsibility as educators to focus on the student, use them at their fullest, and integrate them into existing curricula to best benefit the students [14].

Medical schools need to improve the utilization of social media by their faculty and students by developing activities and encouraging their usage in education. Medical institutions should also guide students on how to get the maximum benefit from social media and how to avoid its drawbacks, such as distractibility [15].

Conclusion

Social media is effective as a medical teaching tool as it improves enthusiasm in academics and kindles interest in clinical learning, making learning fun and lively, without much distraction to students and can be integrated in the medical educational context.

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Original Research Article

A cross sectional study of correlation between serum uric acid level and micro-albuminuria in Type 2 Diabetes Mellitus patients

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Abstract

Background: Even though the role of serum uric acid as an early marker of diabetic nephropathy has been documented in many western studies, the amount of literature on the subject is very limited.
Objectives: To study the association between serum uric acid and micro-albuminuria in patients with Type 2 Diabetes Mellitus.
Materials and methods: The current study was a cross sectional study, conducted in the Department of Internal Medicine, Velammal medical college and hospital, which is a tertiary care teaching hospital. The study has included a total of 269 subjects with Type 2 DM, recruited by convenient sampling. Serum uric acid was measured by Direct Enzymatic Assay and urine micro albumin levels were measured by Latex Turbidimetric method. Association between the two variables was assessed by calculating pearson correlation coefficient and the data was represented in a scatter diagram.
Results: The mean age was 54.29 ±11.23 years and mean duration of diabetes was 4.85 years. Males outnumbered females by 2.84 times. There was a moderate, statistically significant correlation between HbA1 C level and serum uric acid in the study group (PCC=-0.353, p value < 0.001). There was a weak positive correlation between the blood urea levels and serum uric acid in the study group (PCC=0.145, P value 0.012). There was a weak, but statistically significant positive correlation between Hba1C values (PCC=0.170, p value 0.005), total cholesterol (PCC=0.180, p value 0.003), LDL cholesterol (PCC=0.165, p value 0.007) and urine micro albumin levels in study population. The

odds of micro albuminuria were 1.02 times (95% CI 0.58 to 1.79, p value 0.944) in people with uric acid between 5 to 7.49 and 1.855times (95% CI 0.56 to 6.081, p value 0.30) in patients with uric acid level of 7.5 and above, as compared to people with uric acid levels below 5 mg/dl.

Conclusions: Higher Hba1c levels were associated positively with elevated serum uric acid and micro albuminuria. Even though there is a weak positive correlation between the uric acid levels and micro albuminuria it was statistically not significant. The odds of micro albuminuria only slightly increased with increasing serum uric acid levels and duration of diabetes, but this association was statistically significant.

Key words

Type 2 Diabetes mellitus, Uric acid, Micro albumin.

Introduction

Nephropathy related to Diabetes mellitus (DM) is the commonest cause of end-stage renal disease in the developed countries and the number is growing each year [1]. World Health Organisation estimates that globally, about 422 million adults were diagnosed with diabetes in 2014, compared to 108 million in 1980 and the global prevalence of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population [2]. Also over the past decade, prevalence of diabetes rose faster in low- and middle-income countries than in high-income countries.

The magnitude of impact of type 2 DM on kidney is such that nearly 25–40% of patients develop kidney damage and chronic kidney disease [3]. Additionally, among these patients, the risk of cardiovascular disease (CVD), the morbidity and premature mortality associated with DM and CKD is greatest with attendant economic burden on the individual and the country [4, 5].

The pathogenesis of nephropathy associated with diabetes is complex and still not well understood [6]. It has been postulated that it occurs as a result of the interplay of metabolic and hemodynamic factors in the renal microcirculation.

Evidence from numerous longitudinal studies have pointed that hyperuricemia is associated with an increased risk of cardiovascular events and death in both non-diabetic and type 2 DM individuals [7-10]. Hyperuricemia, an inflammatory factor, is found to be an independent predictor of vascular complications and mortality in patients with type 2 DM [11] and is associated with excess risk for development of diabetes [12, 13]. However, the relationship between diabetes mellitus and hyperuricemia is still subject to controversy.

On the other hand, micro-albuminuria is considered as the proxy of early stages of diabetic nephropathy and has been recognized as a marker of early glomerular and vascular damage [3]. There is an association of albuminuria and impaired glomerular filtration rate with more than normal serum uric acid (SUA) levels in type 2 DM patients [14]. The present study aimed to assess the relationship between SUA and albuminuria in type 2 DM patients.

Materials and methods

Study design: The study was a cross sectional study

Study setting: The study was conducted in the department of internal medicine, Velammal medical college and hospital, which is a tertiary care teaching hospital.

Study population: All the known and newly diagnosed cases of diabetes mellitus were included in the study.

Study duration: The study was carried out between July 2016 and December 2016.

Inclusion criteria

- Patients with Type 2 Diabetes mellitus
- Adult population > 20 years of age, belonging to both genders

Exclusion criteria

- Patients with elevated renal parameters and gout were excluded

Study procedure: Serum uric acid was measured by Direct Enzymatic Assay and urine microalbumin levels were measured by Latex Turbidimetric method.

Ethical considerations: The study was approved by institutional human ethics committee. Informed written consent was obtained from all study participants. Confidentiality of the study participants was maintained throughout the study.

Statistical methods:

Urine micro albumin was considered as the primary outcome variable. Serum uric acid was considered as primary explanatory variable. Duration of diabetes mellitus, age of the patient, glycemic control as assessed by Hba1C levels, lipid profile parameters were considered as explanatory variables. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Data was also represented using appropriate diagrams like bar diagram, pie diagram and box plots. Association between quantitative explanatory and outcome variables was assessed by calculating Pearson correlation coefficient and the data was represented in a scatter diagram. P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis [15].

Results

A total of 269 patients were included in the final analysis. The mean age of the study participants was 54.29 ±11.23 years. Males outnumbered females by 2.84 times in the study population. The mean duration of diabetes was 4.85 years. Among the total, 60.59% were known cases of diabetes and remaining 39.41% were diagnosed recently (< 1 year). The proportion of current smokers and alcoholics was 17.84% and 24.91% respectively. Known hypertensive constituted 29% and another 14.87% were recently diagnosed with hypertension. The mean HbA1c level in study population was 7.53 %. The mean values of lipid profile parameters, blood urea and serum creatinine were within normal physiological limits. The mean serum uric acid level was 4.95±1.48 and the mean urine micro albumin level was 34.56± 71.39 in study population (**Table - 1**).

Table - 1: Descriptive analysis of socio demographic parameters in study group (N=269).

Parameter	Summary
Age (mean ±SD)	54.297 ± 11.23
Male : Female Ratio	2.84:1
Duration of diabetes (mean ±SD)	4.845 ± 6.51
Diabetes History	
Known Case	163(60.59%)
Recently Diagnosed	106(39.41%)
Smoking status	
• Past	23 (8.55%)
• Current	48(17.84%)
Alcohol Status	
• Past	23(8.55%)
• Current	67(24.91%)
Hypertension	
Known Case	78 (29%)
Recently Diagnosed	40(14.87%)
HbA1c	7.536 ± 1.843
Total Cholesterol	190.4 ± 46.60
HDL	40.24 ± 8.110
LDL	118.8 ± 37.33
TGL	118.8 ± 139.4
Blood Urea	22.28 ± 7.544
Serum Creatinine	0.805 ± 0.225
Uric Acid	4.955 ± 1.482
Urine Micro albumin	34.56 ± 71.39

There was a moderate, statistically significant correlation between HbA1 C level and serum uric

acid in the study group (PCC=-0.353, p value < 0.001). There was a weak positive correlation between the blood urea levels and serum uric acid in the study group (PCC=0.145, P value 0.012). The other factors had shown no statistically significant correlation with serum uric acid in the study group (**Table - 2**).

Table - 2: Correlation between various diabetes related parameters and Serum Uric Acid in study group.

Parameter	Pearson Correlation Coefficient(PCC)	P value
Age	0.021	0.737
Duration of diabetes	0.013	0.838
HbA1c	-0.353	***<0.001***
Total Cholesterol	0.023	0.706
HDL	-0.048	0.434
LDL	-0.028	0.644
TGL	0.043	0.482
Blood Urea	0.152	***0.012***

There was a weak, but statistically significant positive correlation between Hba1C values (PCC=0.170, p value 0.005), total cholesterol (PCC=0.180, p value 0.003), LDL cholesterol (PCC=0.165, p value 0.007) and urine micro albumin levels in study population. Other factors had shown no statistically significant association with urine micro albumin in the study group (**Figure – 1**, **Table – 3**).

The odds of micro albuminuria was 1.02 times (95% CI 0.58 to 1.79, p value 0.944) in people with uric acid between 5 to 7.49 and 1.855 times (95% CI 0.56 to 6.081, p value 0.30) in patients with uric acid level of 7.5 and above, as compared to people with uric acid levels below 5 mg/dl (**Figure – 2**).

Then compared to people with diabetes for less than 5 years, the odds of micro albuminuria was 1.21 (95% CI 0.56 to 2.62, p value 0.622) and 1.16 times (95% CI 0.50 to 2.68, p value 0.718) in patients with duration of diabetes 6 to 10 years and > 11 years respectively (**Table - 4**).

Table - 3: Correlation Between Various Diabetes Related Parameters and Urine Micro Albumin in Study Group.

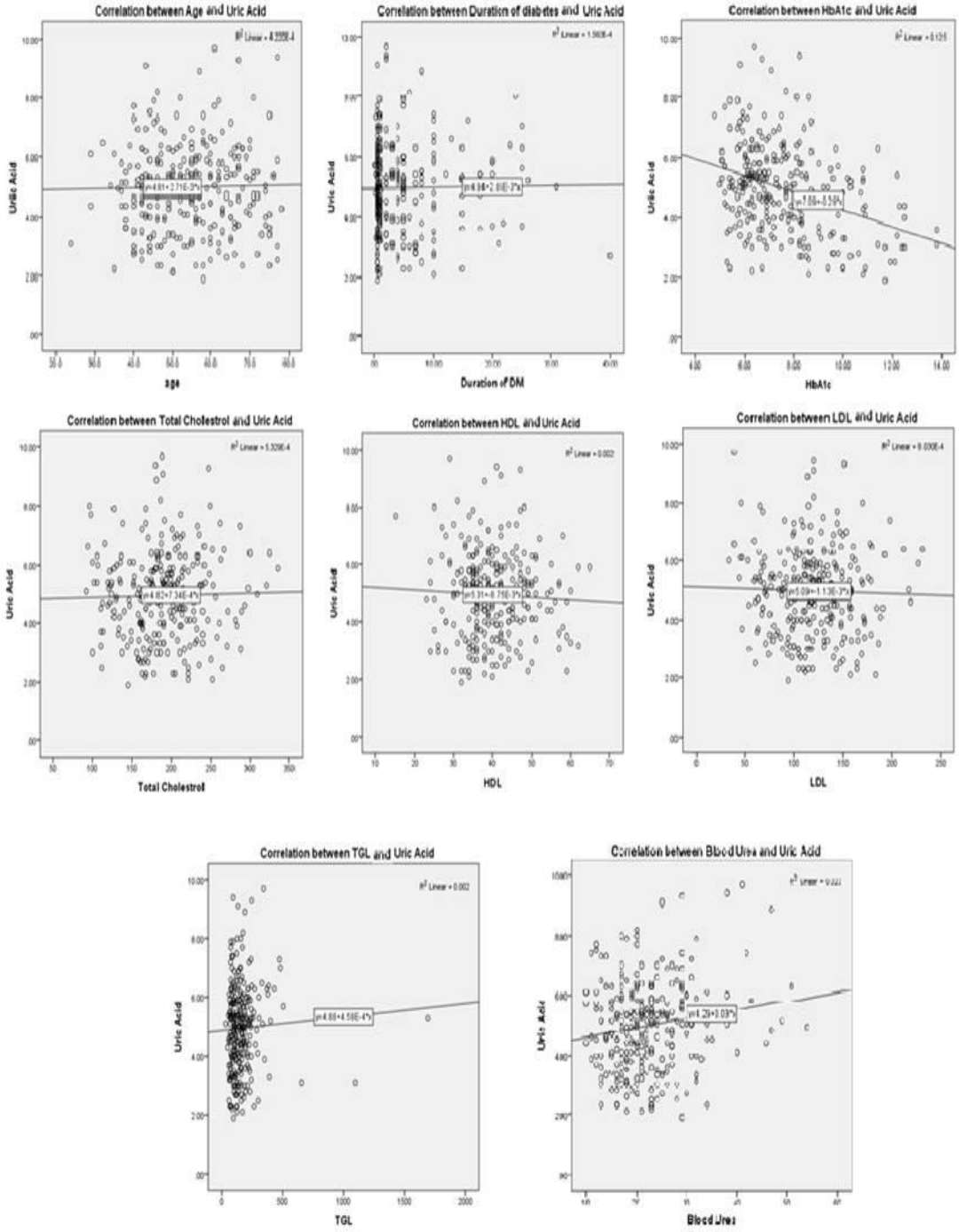
Parameter	Pearson Correlation Coefficient (PCC)	P value
Age	-0.103	0.091
Duration of diabetes	0.099	0.104
Hba1c	0.170	0.005
Total Cholesterol	0.180	0.003
HDL Cholesterol	-0.054	0.380
LDL Cholesterol	0.165	0.007
TGL	0.109	0.074
Blood Urea	0.048	0.438
Uric Acid	-0.001	0.984

Discussion

Uric acid, the end product of purine catabolism in humans is an anti-oxidant and has long been hypothesized that it might protect against oxidative stress or cell injury and ageing [16]. However, paradoxically the anti-oxidants can become pro-oxidant compounds in certain situations, particularly when they are present in blood at above normal levels. In line, current epidemiological studies have found an association between elevated SUA concentration and increased albuminuria [17-21], owing to the endothelial damage caused by SUA [21].

The present study findings revealed that mean SUA level was 4.95 mg/dl. A similar SUA value was reported by Suzuki K et al, (5.1 mg/dL) [22]. Also raised hyperuricemia significantly increases chronic micro/macro vascular complications in type2 DM other chronic vascular complications like coronary artery disease, cerebrovascular disease, diabetic retinopathy and peripheral neuropathy [19].

Figure - 1: Correlation between various diabetes related parameters and Serum Uric Acid.



There is mounting evidence associating albuminuria and SUA in type2 DM patients [23-26]. However, several of these studies are cross-sectional in design and very few of such studies assessed whether a high-baseline serum uric acid predicts development of microalbuminuria [20]. The mechanism of SUA influencing albuminuria is that the increased SUA induce glomerular damage that in turn leads to albuminuria, which also increases the urinary albumin-creatinine ratio [22].

Contrasting with the findings of several large-scale studies, there was a moderate but significant correlation between HbA1c level and serum uric acid in the study group (PCC=-0.353, p value < 0.001). The US Third National Health and Nutritional Survey (NHANES III) during

1988-94 assessing 14664 individuals found a bell-shaped relation of fasting glucose levels with serum uric acid levels. Individuals with diabetes showed lower serum uric acid levels and the association was larger among men (p-value for interaction, 0.007).

Figure - 2: Correlation between Diabetes Related Parameters and Urine Micro-Albumin.

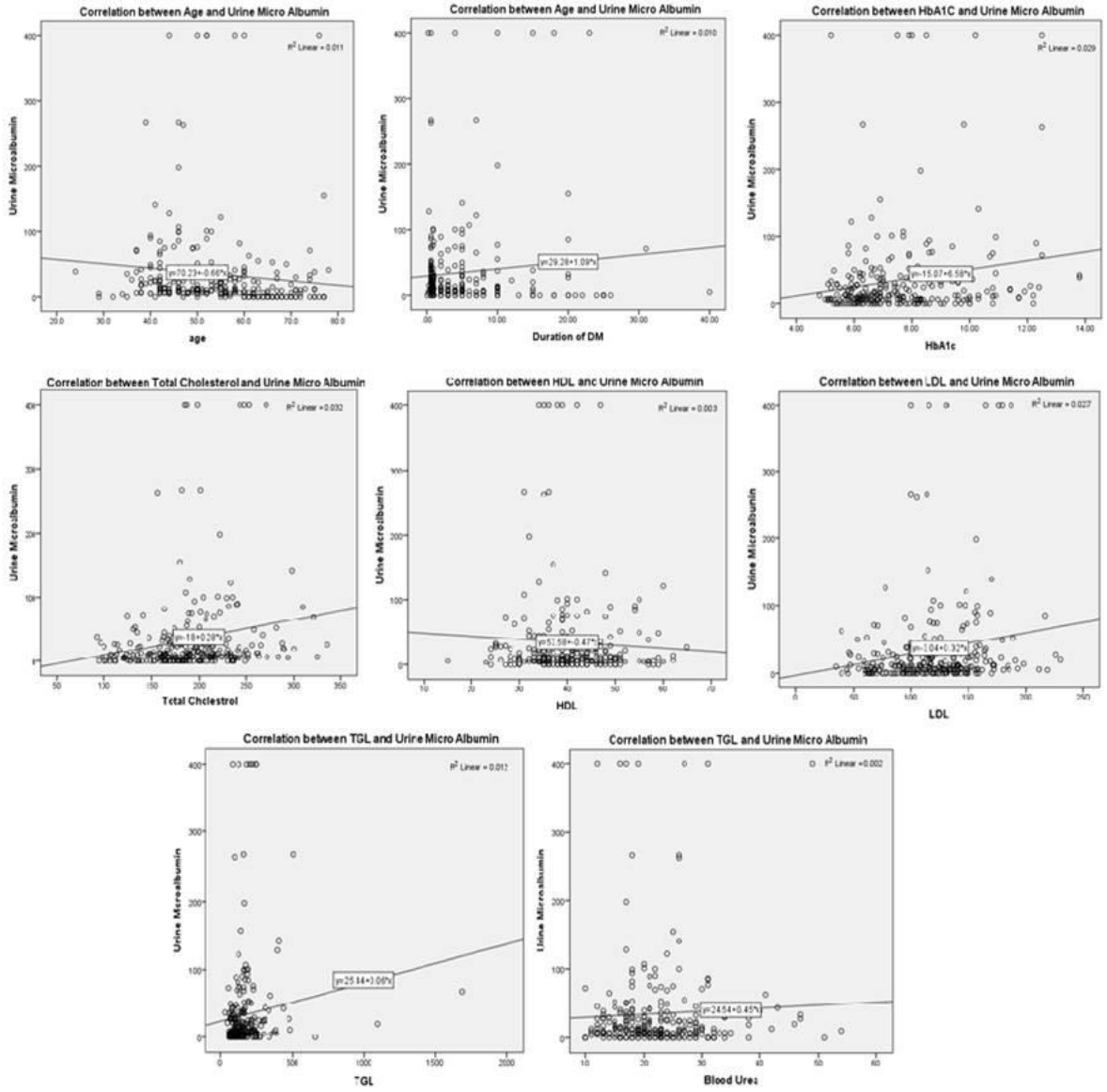


Table - 4: Univariate Logistic Regression Analysis of Factors Influencing Micro Albuminuria.

Parameter	Unadjusted odds ratio	95% CI of odds ratio		P value
		Lower	Upper	
Serum Uric acid (baseline =Below5)				
5 to 7.49	1.021	.581	1.792	0.944
7.5 and above	1.855	.566	6.081	0.30
Duration of diabetes (Baseline =< 5)				
6 to 10	1.214	.562	2.624	.622
> 11	1.166	.506	2.686	.718

There was a weak positive correlation between the blood urea levels and serum uric acid in the study group (PCC=0.145, P value 0.012).

There was a weak, but statistically significant positive correlation between Hba1C values (PCC=0.170, p value 0.005), total cholesterol (PCC=0.180, p value 0.003), LDL cholesterol (PCC=0.165, p value 0.007) and urine micro albumin levels in study population.

Urine micro-albumin was found to be 34.56mg/L. Contrastingly the micro-albumin was less in the studies of Wu D, et al., (22.32 mg/dL) [27]. The presence of urinary albumin was significant across the age groups ($p<0.05$) and males had significantly higher albuminuria than females ($p<0.05$). Evidence suggests that both elevated uric acid and microalbuminuria levels were significantly associated with diabetic chronic micro/macro-vascular complications. Monitoring of their levels provides a predictive value for a presence of chronic micro/macro-vascular complications in patients with type 2 DM [11, 19, 28, 29].

Conclusions

Higher Hba1c levels were associated positively with elevated serum uric acid and micro albuminuria. Even though there is a weak positive correlation between the uric acid levels and micro albuminuria it was statistically not significant. The odds of micro albuminuria only slightly increased with increasing serum uric acid levels and duration of diabetes, but this association was statistically significant

Limitations

Considering the lower effective sample size, the study could not assess the relative contribution of various influencing factors on microalbuminuria by multivariate analysis

Recommendations

- Large scale prospective studies to assess the association of uric acid with subsequent development of micro albumuria needs to be conducted
- The effect of any interventions to reduce the uric acid levels on micro albuminuria also needs to be explored

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Estimation of Prolactin Level in Women with Carcinoma Breast

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Introduction

In recent times the incidence of tumors of breast is quite alarming all over the world. In 2012, nearly 1.7 million new cases of breast cancer is reported worldwide.

The occurrence of breast tumors is considered to be due to very many risk factors. Based on epidemiological data, risk factors for breast cancer fall in 3 main groups: Genetic, endocrine and environmental. Each may be of major, intermediate or minor importance. Major risk factors include 1. Female gender 2. Increasing age 3. History of previous breast cancer 4. Family history 5. Genetic factors (mutation of BRCA 1 or BRLA 2), appear to account for over half of all the identifiable breast cancer families.(1) Intermediate risk factors include alcohol, diet, nulliparity, early menarche, late menopause, oral contraceptives, hormone replacement therapies, benign proliferative breast disease, irradiation etc.

The fact that Prolactin (PRL) is important in all phases of breast development and critical to breast control has been established by careful studies.(2) Development of breast involves coordinated action of many hormones including prolactin, estrogen, progesterone, gluocorticoids, insulin, growth hormone and thyroid hormone. Duct growth is promoted by estrogen, alveolar development is controlled by Prolactin & progesterone, and lactation by Prolactin.(3)

The prolactin level is found to increase during menarche as well as in the premenopausal women.(4) Higher levels are also found during pregnancy both in the mother and the fetus. At term prolactin level is 10 times as non pregnant women. High levels of prolactin appear to be essential for the initiation of lactation. Reduction in the prolactin level following menopause has been reported.(5) Peak levels of prolactin occur during middle to end of night and lowest at midday.(6)

The role of prolactin in galactorrhea and infertility in women is largely known. Locally produced prolactin acts as an autocrine/ paracine factor in breast cancer evolution.(7) Though little is produced in breast, due to local availability it plays an important role in tumor formation.

JAK2 is required for prolactin mediated maintenance of differentiated alveolar cells. Prolactin may promote breast cancer via JAK 2/STAT 2 signaling pathway.(8) Breast tumors also express higher levels of prolactin receptor when compared to healthy tissue. Conflicting reports are found regarding the involvement of prolactin in cases of carcinoma breast. Hence this study is taken up to find whether the increasing incidence of breast cancer has any relation to the prolactin level of the individual and also its relevance.

Materials and Method

Type of study: Cross sectional study
Study design: Randomized control trial
Study setting: The Study was done at Government Rajaji Hospital attached to Madurai Medical College, Madurai after obtaining Institutional Ethical Clearance.
Study population: A total of 39 female patients between the age group of 35-65 years have been studied over a period of one year. 27 of them had malignant tumor (invasive ductal carcinoma) of the breast. Patients were divided into these groups following histopathological examination of the tissue removed at surgery. Of them 12 were premenopausal and 15 were postmenopausal. Twelve normal women having similar age, weight and menstrual history were selected and served as control. Of them 7 were premenopausal and 5 were postmenopausal.

After obtaining informed consent from the selected individuals, the proforma was filled in eliciting the required data to find the possible risk factors. The subjects were divided according to their menstrual status with reference to their case history. Subjects were classified as postmenopausal if two years had elapsed since their last menses. In premenopausal subjects blood samples were taken during the follicular phase of the menstrual based on their case history. Pregnant /lactating women were excluded from the study.

All patients included in this study were without any prior treatment. As far as could be ascertained, no patient was receiving phenothiazines, L-Dopa, monoamine oxidase inhibitors, or other drugs known to affect the secretion of Prolactin. Each patient had a blood sample taken between 11.00 am and 5.00 pm and blood was allowed to clot and the resulting serum was frozen at -20˚ C until assayed. Serum Prolactin level was estimated by Immuno Radio Metric Assay (IRMA).
Principle of the test: This immunoradiometric assay is a non competitive assay technique to quantitate

prolactin in serum sample. In IRMA, two antibodies generated against different portions (epitopes) of the same antigen are used. The capture antibody is coupled to magnetic particles and used as the solid phase and the detection antibody is radiolabelled with ^{125} I. When antigens (standards or sample) are incubated with the tracer and the solid phase, it simultaneously binds to both the antibodies in a bridge or sandwich fashion. Their entire complex remains bound to the magnetic particle. The bound radioactivity associated is then quantitated using a gamma counter calibrated for ^{125} I. The concentration of prolactin in the sample is directly proportional to the radio activity. The concentration of prolactin of unknown sample is read off by the interpolation from the curve.

Summary of the assay producer: Sample or Standard is assayed in duplicate.

Step 1- Addition: To the assay tubes added successively are 1) 50 micro liters of standard or sample 2)100 micro liters of tracer 3)100 micro liters of solid phase with constant stirring mixed well.

Step 2: Incubation: Overnight without stirring at 25˚C

Step 3: Counting: 2ml of wash buffer added to each tube except total tube (contains 100 micro liters of only Tracer) .Washing repeated twice. The centrifugate is counted in gamma counter for one minute. Graph plotted.

Calculation of results

1. Subtract the back-ground from all counts to get corrected counts.
2. Take average of all duplicates.
3. Average counts of tubes 1 & 2 are called total counts.
4. % Bound (B) / total (T) = Corrected average counts of the standards / Corrected average counts of the total tubes.
5. Determine sample values from the standard curve.

Statistical Analysis: The quantitative data was checked for normality and summarized using mean/median and standard deviation/ interquartile range as appropriate. Categorical data is summarized as frequencies and percentages. Prolactin level in carcinoma breast group and control group was compared using student t test & chi square test. An arbitrary cut off of 0.05 was used to interpret significance of p value.

Results

Table 1: Association of increased prolactin level with carcinoma breast

Chi-square test:

	No of subjects	Increased Prolactin Level	Normal Prolactin Level
Carcinoma Breast	27	19	8
Control	12	0	12

$X^2 = 13.77$ P = 0.0002 P < 0.05 significant

Table 2: Association of increased prolactin level with carcinoma breast

Student t Test:

Prolactin level	t	p
Carcinoma X Control	3.98	0.00037*

P < 0.05 significant

Table 3: Comparison of prolactin level between pre and postmenopausal control group

Group	Number of Subjects	Mean Prolactin level ng/ml	Standard Deviation
Control	12	7.51	3.90
Premenopausal	7	9.44	3.43
Postmenopausal	5	4.79	2.88

Table 4: Comparison of prolactin level between pre and post menopausal Carcinoma breast group

Group	Number of Subjects	Mean Prolactin level ng/ml	Standard Deviation
Carcinoma Breast	27	52.40	38.696
Premenopausal	12	74.76	44.83
Postmenopausal	15	34.36	20.36

Table 5: Comparison of prolactin levels between Early and Advanced carcinoma breast group

Carcinoma Group	Number of Subjects	Mean Prolactin level ng/ml	Standard Deviation
Early Disease Status	11	42.997	37.37
Advanced Disease Status	16	58.80	39.33

Early disease status includes stages I & II
Advanced disease status includes Stages III & IV

Table 6: Comparison of Prolactin level between 1. Pre & Post menopausal women 2. Early & Advanced disease status

Prolactin level	t	p
Premenopausal X Postmenopausal	3.12	0.0044*
Early X Advanced Disease status Disease status	1.05	0.3051
Early Disease Status Premenopausal X Postmenopausal	3.46	0.0071*
Advanced disease Status Premenopausal X Postmenopausal	1.77	0.0984

P < 0.05 significant

Observation:
Among 12 controls all were with normal prolactin level < 20ng/ml
Among 27 carcinoma breast cases, 70.4% were with increased prolactin level
29.6% were with normal prolactin level.
Considering the incidence of risk factors in the patients with carcinoma breast the findings in the present study were as follows:
14 – 51.9% - were with no known risk factor
4 – 14.8% - were with family history of tumor breast.
5 – 18.5% - were with nulliparity
3 – 11.1% - were with Age at first pregnancy more than 30 years.
6 – 22.2% - were with no breast feeding done.

Discussion

Evidence that Prolactin was a carcinogen in rat mammary cancer was presented in 1969.[9] Since then there are numerous reports in the literature of investigation of relationship between prolactin and various aspects of breast cancer. The majority of these have concentrated on a possible etiological association between the incidence of breast cancer and abnormality in secretion. Many have found suggestive but by no means definitive evidence of such an association. Studies for prolactin level in cancer breast patients have also produced conflicting reports.

Thus elevated prolactin levels are reported in certain groups of cancer breast patients[10] and in high risk families.[11] Despite these observations several reports suggest that prolactin levels are normal in women with breast cancer.[12,13,14]

The present study has demonstrated that there is a significant increase in the level of prolactin in cancer breast patients when compared with control group. p value is less than 0.05 as shown in Table 1 & 2. Mean serum prolactin level in the control group is 7.51ng/ml (Table 3) which is well below the normal value of 20ng/ml and is definitely less when compared with the carcinoma group where the mean value observed is 52.40 ng/ml (Table 4).

Also the level of prolactin is significantly higher in premenopausal group (74.76ng/ml) when compared with postmenopausal group (34.36ng/ml) in carcinoma breast patients as shown in Table 4&6. These findings are in agreement with the study done in 1986 on plasma lipids and prolactin in patients with breast cancer[15] where high levels of prolactin (>100 ng/ml) were found more in premenopausal invasive breast cancer patients with distant metastases than in postmenopausal group. There is no significant difference in prolactin level between early and advanced carcinoma group (Table 6) even though a higher mean prolactin level was found in advanced (58.80ng/ml) than in early carcinoma group(42.99 ng/ml) as shown in Table 5.

Unopposed estrogen rendered the breast more susceptible to carcinogenesis.[16] Estrogen stimulates prolactin secretion and also up regulates human prolactin receptor gene expression in the progress of the disease.[17]

Feeding high fat diets causes elevation of plasma prolcatin concentration in man.[18] Increasing parity was related to a steady decrease in prolactin concentration.[19] Thus bodyweight and parity might influence breast cancer risk by being associated with changes in blood prolactin concentration. It was also evident that suppression of high prolactin levels increased the response to cytotoxic therapy in tumor patients.[20]

The interpretation of the result obtained in present study depends on the confidence with which a single prolactin estimate between 9.30 a.m to 5.00 p.m represents the prolactin status of the patient. The defined time period was chosen to avoid major variation due to the diurnal rhythm of prolactin. By 9.30 a.m the fall of prolactin levels from their nocturnal sleep induced peak has reached a plateau.[21]

Though stress increases the prolactin level, a number of investigations have concluded that venipuncture rarely induces prolactin release.[22] Studies have shown that prolactin levels vary depending upon the phase of menstrual cycle.[23] In the present study since blood samples were taken only in the follicular phase of the premenopausal subjects, the difference found in Prolactin level cannot be attributed to the phase of menstrual cycle.

Similarly because the blood sample is taken prior to any treatment, the difference in the level cannot be attributed to surgery induced increased prolactin level or chemotherapy or Hormonal therapy induced suppression of prolactin level. Also studies show that routine breast examination does not alter serum prolactin level.[24] Though artefactual high prolactin levels may occur due to pulsatile release, number of investigations have concluded that frequent sampling does not improve the value of a result.[25] These studies suggest that the result of the single estimate of prolactin level in the present study may be viewed with confidence.

Although prolactin has been long suspected to be involved in the progression of human breast cancer, the failure of clinical improvement by treatment with dopamine agonists (which lower circulating levels of prolactin) reduced the interest of oncologists concerning a potential role of prolactin in the development of breast cancer. Within the last few years however, with the advent in molecular biology several studies have supported the role of prolactin in breast cancer.

Recent studies have reported that prolactin is also synthesized and secreted by mammary epithelial cells. There is expression and up regulation of prolactin receptors in tumor breast cell lines.[26] There is an autocrine / paracrine loop of action of prolactin to promote breast cancer. Prolactin also promotes

metastasis by inducing cell proliferation, altering Stat 5 levels of phosphorylation, changing the expression of human Prolactin receptor isoforms, tumour vasularizaton and cell motility.[27] Also studies show that prolactin receptor antagonists inhibit the growth of breast cancer cell lines.[28]

The other mechanisms such as increased expression of class II HLA antigen and up regulation of the breast cancer susceptible gene BRCA 1 by prolactin in breast cancer cell lines have been suggested for the tumorigenic effect of prolactin.[29,30]

Though in-vitro studies confirm the important role of prolactin in tumors of breast, results showing the same in-vivo are still awaited.

Conclusion

This study has shown a significant elevation of prolactin level in patients with carcinoma breast when compared with the control group. Also it has shown that there is a significant association between increased prolactin level and carcinoma breast. Though the prolactin level is increased in 70.4% of carcinoma breast patients, consideration of whether the prolactin level could be used as an indicator for carcinoma breast requires a larger scale study. Even when high level of prolactin is found in patients with distant metastases progression, further follow up of the cases is required.

This study supports the previous investigations which showed that increased prolactin level is associated with breast cancer and warrants a thorough investigation in future to know whether the hormone prolactin is important in etiology of breast cancer, so that early diagnosis using prolactin level and treatment strategies against prolactin would prove useful in preventing and curing cancer breast.

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Original Article

Prolactin Level In Women With Fibroadenoma Breast-A Cross Sectional Study

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ABSTRACT

Introduction: Prolactin has been proved to be involved in mammary cancer development in humans, but its role in fibroadenoma breast has long been controversial with conflicting reports. Hence this study was done to find out Prolactin level in women with fibroadenoma and if its role in development of tumor is proved, then a feasible drug treatment which could reduce the anxiety and cosmetic problems associated with surgical interventions can be identified.

Objectives:

1. To estimate serum prolactin level in patients with fibroadenoma breast.
2. To compare serum prolactin level of fibroadenoma patients with that of the controls
3. To consider whether prolactin level can be used as an indicator for fibroadenoma breast and has any relation to the disease progression

Materials and methods: A total of 20 female patients between the age group of 18-40 years attending Government Medical College Hospital, Madurai have been studied. Among them 13 patients had fibroadenoma of the breast and 7 normal women served as control. Prolactin level was measured by Immunoradiometric assay.

Results: No significant elevation of prolactin level is seen in women with fibroadenoma breast (mean=25.75ng/ml) when compared with the control and there is no significant association between increased prolactin level and breast fibroadenoma ($X2 = 1.83$; $p = 0.1759$).

Conclusion: Prolactin level is not significantly increased in fibroadenoma breast patients. A large scale study is required for a stronger confirmation. Studying the role of locally produced prolactin and mutation in prolactin receptors might help in proper therapeutic management.

Key Words: Fibroadenoma, Benign tumor, Females, Prolactin.

INTRODUCTION:

In recent times the incidence of tumors of breast is quite alarming all over the world .The most common benign tumor of the breast is fibroadenoma and its overall incidence is 2.2%.[1,2] It is common in young women. It originates from the breast lobule and shows evidence of both connective tissue and epithelial proliferation. The exact etiology of a fibroadenoma is still unknown, while hypersensitivity to estrogen within a lobule has been suggested.

Fibroadenomas are characteristically mobile tumors, varying in size between 1 cm and 10 cm and frequently occur in the upper outer quadrant of the breasts. Women with fibroadenomas have 2.17 times risk for breast cancer.[3]

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Development of breast involves coordinated action of many hormones including prolactin, estrogen, progesterone, gluocorticoids, insulin, growth hormone and thyroid hormone. Duct growth is promoted by estrogen, alveolar development is controlled by prolactin & progesterone and lactation is mediated by prolactin.[4] The fact that Prolactin (PRL) is important in all phases of breast development and critical to breast control has been established by careful studies.[5] Prolactin stimulates mammary epithelial cell proliferation in the presence of estrogen and quickens lobuloalveolar development in the presence of progesterone.

The circulating prolactin levels are lowest at midday and peak levels occur during middle to end of night.[6] Prolactin level is found to increase during menarche as well as in the premenopausal women.[7] Higher levels are also found during pregnancy both in the mother and the fetus. At term prolactin level is 10 times as in a non pregnant women. High levels of prolactin appear to be essential for the initiation of lactation. Once breast enzyme systems are activated, lactation can continue with even low levels of prolactin. Reduction in the prolactin level following menopause has been reported.[8]

Role of prolactin in galactorrhea and infertility in women is largely known. Locally produced Prolactin acts as an autocrine / paracine factor in breast tumor evolution.[9] JAK2 is required for PRL mediated maintenance of differentiated alveolar cells. PRL may promote breast cancer via JAK 2/STAT 2 signaling pathway.[10] Though little is produced in the mammary gland, due to local availability it plays an important role in tumor formation.

Breast tumor cells also express higher levels of PRL receptor when compared to healthy tissue. Estrogen stimulates PRL secretion and also up regulates human PRL receptor gene expression in the progress of the disease. Conflicting reports are found regarding the involvement of Prolactin in cases of tumors of breast. Hence this study is taken up to find whether the increasing incidence of fibroadenoma breast has any relation to the Prolactin level of the individual and also its relevance to the tumor.

MATERIALS & METHODS:

The Study was done at Government Rajaji Medical College Hospital, Madurai after getting clearance from the Institutional Ethical Committee.

Twenty subjects in the age group of 18-40yrs were chosen for the study by simple random sampling. 13 of them had benign tumor (fibroadenoma) of the breast. Patients were identified following histopathological examination of the tissue removed at surgery. All of them were in the premenopausal group. Seven premenopausal normal women having similar age and weight were selected and served as control.

After getting consent from the selected individuals, the Proforma was filled in eliciting the required data to find the possible risk factors. All patients included in this study were without any prior treatment. Women who were pregnant and / or lactating were excluded from the study. In all subjects blood samples were taken during the follicular phase of the menstrual cycle.

As far as could be ascertained, no patient was receiving phenothiazines, L-Dopa, monoamine

oxidase inhibitors, or other drugs know to affect the secretion of prolactin. Each patient had a blood sample taken between 11.00 am and 5.00 pm and blood was allowed to clot and the resulting serum was frozen at -20°C until assayed. Prolactin is estimated by Immuno Radio Metric Assay (IRMA).

Principle of the test:

This immunoradiometric assay is a non competitive assay technique to quantitate prolactin in serum sample. In IRMA, two antibodies generated against different portions (epitopes) of the same antigen are used. The capture antibody is coupled to magnetic particles and used as the solid phase and the detection antibody is radiolabelled with ^{125} I. When antigens (standards or sample) are incubated with the tracer and the solid phase, it simultaneously binds to both the antibodies in a bridge or sandwich fashion. Their entire complex remains bound to the magnetic particle. The bound radioactivity associated is then quantitated using a gamma counter calibrated for ^{125} I. The concentration of prolactin in the sample is directly proportional to the radio activity. The concentration of prolactin of unknown sample is read off by the interpolation from the curve.

Statistical analysis:

The quantitative data was checked for normality and summarized using mean/median and standard deviation / interquartile range as appropriate. Categorical data is summarized as frequencies and percentages. Prolactin level in fibroadenoma group and control group was compared using student t test & chi square test. P value < 0.05 is the cut off to determine statistical significance.

RESULTS:

Table-1. Mean Prolactin level in Fibroadenoma patients.

Group	Number of subjects	Mean Prolactin level ng/ml	Standard deviation
Fibroadenoma breast (all premenopausal)	13	25.75	24.77

Table-2. Association of Prolactin level with fibroadenoma breast:

Chi-square test:

	Number of subjects	Increased Prolactin Level	Normal Prolactin Level
Fibroadenoma Breast	13	5	8
Control	12	0	7

$X2 = 1.83 \quad p = 0.1759$

Table-3. Student t Test:

Prolactin level	t	p
Fibroadenoma XControl	1.71	0.1041

OBSERVATION:

Among 07 controls ,all were with normal Prolactin level < 20mg/ml.

Among 13 fibroadenoma breast cases,

5 i.e. 38.5% - were with increased prolactin level

8 i.e. 61.5% - were with normal prolactin level

DISCUSSION:

Evidence that Prolactin is a carcinogen in rat mammary cancer was presented in 1969.[11] Since then there are numerous reports in the literature of investigation of relationship between Prolactin and various aspects of breast tumors and many have found suggestive association between Prolactin and breast cancer. Studies for Prolactin level in

fibroadenoma breast patients have also produced conflicting reports. Though few studies report that prolactin level is elevated in fibroadenoma breast patients, there are studies which had showed normal prolactin level in patients with benign breast tumors.[12] In another study, only 27% & 5% of fibroadenoma patients had elevated prolactin.[13,14] The present study results also showed increased prolactin levels only in 38.5% of fibroadenoma patients with normal prolactin level in the remaining 61.5% (as shown in table1).There is no significant increase in the level of prolactin in fibroadenoma patients when compared with the control (Table 2,3).

The interpretation of the result obtained in present study depends on the confidence with which a single prolactin estimate between 9.30 a.m to 5.00 p.m represents the prolactin status of the patient. The defined time period was chosen to avoid major variation due to the diurnal rhythm of prolactin. By 9.30 a.m the fall of prolactin levels from their nocturnal sleep induced peak has reached a plateau[15]

Though stress increases the prolactin level, a number of investigations have concluded that venepuncture rarely induces prolactin release.[16]

Studies have shown that prolactin levels vary depending upon the phase of menstrual cycle.[17] In the present study since blood samples are taken only in the follicular phase of the premenopausal subjects, the difference found in prolactin level cannot be attributed to the phase of menstrual cycle.

Similarly because the blood sample is taken prior to any treatment, the difference in the level cannot be attributed to surgery induced increased prolactin level or chemotherapy or Hormonal therapy induced suppression of prolactin level. Also studies show that routine breast examination does not alter serum prolactin level.[18] Though artefactual high Prolactin levels may occur due to pulsatile release, number of investigations have concluded that frequent sampling does not improve the value of a result.[19] These studies suggest that the result of the single estimate of prolactin level in the present study may be viewed with confidence.

Within the last few years however, with the advent in molecular biology several studies have supported the role of prolactin in fibroadenoma. Prolactin secretion, in the tumor initation phase influences the metabolism of mammary epithelium by increasing its sensitivity to carcinogens and later directly acting as a promoter of transformed epithelium.[20]

Prolactin alters progesterone and estrogen ratios and increases the expression of estrogen receptors in mammary gland[21] Estrogen replacement therapy increased the risk of fibroadenoma by potentiating the proliferation of mammary epithelial tissue by prolactin[22].Also increased estrogen increases plasma prolactin levels, which in turn interact with estradiol to cause mammary gland hypertrophy.

Recent studies have reported that prolactin is also synthesized and secreted by mammary epithelial cells. There is an autocrine / paracrine loop of action of prolactin to promote breast tumor. Hence another possible mechanism that can lead to tumor breast might include local over expression of prolactin inducing morphological and functional defects in mammary gland in the presence of normal serum prolactin.[23] That might be the reason

Dopamine agonists fail to show clinical improvement in patients with progressing tumor.

Also studies have shown that prolactin receptor antagonists inhibit the growth of breast cancer cell lines confirming the fact that prolactin receptors are up regulated in tumor breast cell lines and also functional mutation occurs in prolactin receptors.[24, 25, 26]

Prolactin also promotes tumor growth by modulating cell cycle regulators in mammary tumor cells and by stimulating angiogenesis.[27] Another interesting observation made in mouse mammary glands is that prolactin promotes tumor growth by its anti apoptotic action via STAT 5.[28] At, genetic level it was shown that prolactin gene disruption arrests mammary gland development and retards tumor growth.[29]

The role of prolactin in fibroadenoma is still controversial. A better understanding of genetic and molecular characteristics of prolactin is needed to aid treatment.

CONCLUSION:

In this study, there is no significant elevation of serum prolactin levels in fibroadenoma breast when compared to normal. As the number of cases are few to give an effective interpretation, a thorough investigation in future is required with more number of patients. This could open potential theurapeutic approaches for fibroadenoma. A still thorough understanding of the role of prolactin and its receptor in tumorigenesis is needed. Parameters like the duration of hormone exposure, involved target tissue and genetic background should also be studied for understanding the tumorigenic effects of prolactin.

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A Statistical Model to Predict Instantaneous Blood Pressure Using Velocity Measurements in the Radial Arteries.

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ABSTRACT

Background: Ambulatory BP monitoring (ABPM) provides a more reliable measure of a patient's BP than isolated clinic measures for continuous monitoring and rigorous control of hypertension. Regular users of ABPM hesitate to wear it because of aesthetic considerations and pain during inflation and deflation of the cuff. **Methods:** A statistical model is suggested from this study to aid in the development of wearable ABPM on the wrist which would aesthetical be acceptable and without pain. The model uses Blood flow velocities of the left and right radial arteries and their wall thickness to predict the Blood pressure at the right arm. Blood flow velocities (Peak systolic velocity- PSV and End diastolic velocity - EDV in cms/sec) and vessel wall thickness (in mm) were measured using B mode ultrasound and Doppler of 99 healthy persons. **Results:** The blood pressure of the right arm was measured using a mercury sphygmomanometer prior to the measurement of the Blood flow velocities. Systolic BP = 1.183 (LRA PSV) + 38.903 (LWT) +72.193, Diastolic BP = 5.211 (LRA EDV) + 56.071 (LWT) + 26.231, Systolic BP = 1.753 (RRA PSV) + 40.060 (RWT) +59.659, Diastolic BP = 4.302 (RRA EDV) + 28.378 (RWT) + 42.795. **Conclusion:** This statistical model needs further refinement and can be only used as an initial step in the modeling of Blood pressure based on the Blood flow velocities in the development of wrist- wearable ABPM instruments.

Keywords: Diastolic BP, Predicting, Systolic BP.

INTRODUCTION

According to World Health Organization the World Health Statistics of 2012 29.2 percent of men and 24.8 percent of women have high blood pressure.[1] Hypertension is universally-recognized as a predictor of cardiovascular, circulatory and cerebrovascular disease events where early treatment and control of blood pressure is required. Ambulatory blood pressure monitoring (ABPM) at regular intervals for 24 hours sense some blood pressure behaviors that are correlated with disease risk.[2] It has been very useful in identifying dippers from non-dipper blood pressure pattern during sleep which is reported as a predictor of cardiovascular and cerebrovascular risk. ABPM is also very useful in evaluating the effectiveness of oral antihypertensive medication. ABPM uses Sphygmomanometer. Daily users of ABPM hesitate to wear it because of pain during inflation and deflation of the cuff which could potentially damage tissue and because of the noises from cuff, and its appearance. Simpler instruments should be developed to monitor blood pressure during ambulation without the difficulties of wearing a cuff. An ambulatory blood pressure monitor attached to the wrist may be attractive aesthetically for users. This study will test the hypothesis that Blood pressure at the arm can be predicted using Peak blood flow velocities in the Radial arteries. The results could be used in the development ABPM instrument which is user friendly, wearable sensing system at the wrist and aesthetically acceptable.

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MATERIALS AND METHODS

Both male and female who visited the master health clinics were included in this study. A total of 99 subjects took part in this study of which 60 (61%) were males and 39 (39%) were females. Subjects with major illnesses including cardiovascular illness and on antihypertensive medications were excluded. Sonographic examination of the abdomen is a routine examination for these subjects during which blood flow velocities in radial arteries were additionally determined sonongraphically. Supine

Blood pressure was measured on the right arm by mercury sphygmomanometer before the time of determination of blood flow velocities at the radial arteries.

Gray scale B mode ultrasound and doppler study was done using high frequency linear probe (10 – 12 MHz) of GE VolusonP8 and E8 Expert ultrasound machines. Vessel Wall thickness, calcification and plaques were measured in distal radial artery at the wrist in both upper limbs. On spectral Doppler, angle corrected Peak Systolic Velocity (PSV) and End Diastolic Velocity (EDV) was measured by placing the sampling gate at the center of the lumen.

RESULTS

Table 1: Demographic characteristics of the study subjects.

Demographic characteristics	Frequency (n)	Percent (%) **
Sex		
Male	60	61
Female	39	39
Age group		
Below 30	7	7
31-40	17	17
41-50	32	33
51-60	20	20
Above 60	23	23

**Rounded off

[Table 1] presents the demographic characteristics of the study subjects. From the findings, it is observed that the majority of the subjects are male (61%) whereas the females are only 39 percent. When the age groups of the subjects are considered, around 33 percent of the subjects aged between 41 and 50 years which are followed by, 23 percent aged more than 60 years age group, 20 percent aged 51-60 years and a minimum number of subjects are below 30 years age group.

Table 2: Descriptive statistics for the blood pressure parameters.

Parameters	Min.	Max.	Mean	SD
Systolic BP	100.0	190.0	127.27	15.64
Diastolic BP	60.0	110.0	79.70	11.91
RRA PSV	21.0	55.0	30.66	6.58
RRA EDV	2.0	12.0	6.29	1.94
LRA PSV	17.0	60.0	34.88	10.39
LRA EDV	2.0	11.0	6.43	1.43
RWT	0.3	0.6	0.35	0.06
LWT	0.3	0.5	0.36	0.06

RRA PSV – Right Radial Artery Peak Systolic Velocity (cms/sec)
RRA EDV - Right Radial Artery End Diastolic Velocity (cms/sec)
LRA PSV – Left Radial Artery Peak Systolic Velocity (cms/sec)
LRA EDV - Left Radial Artery End Diastolic Velocity (cms/sec)
RWT – Right Wall Thickness (mm)
LWT – Left Wall Thickness (mm)

[Table 2] shows the summary statistics like minimum, maximum and mean of the study parameters. On an average, the subjects have 127.27±15.64 mmHg systolic BP, 79.70±11.91 mmHg diastolic BP, 30.66±6.58 cms/sec RRA PSV, 6.29±1.94 cms/sec RRA EDV, 34.88±10.39 cms/sec LRA PSV, 6.43±1.43 cms/sec LRA EDV, 0.35±0.06 mm RWT and 0.36±0.06 mm LWT.

Hypothesis (H1): LRA PSV and LWT are positive relationship with systolic BP.

Table 3: Predicting systolic BP with the assistance of LRA PSV and LWT.

Predictors	Unstandardized Coefficients		Adjusted R-square	t-value	p-value
	Beta (β)	SE			
(Constant)	72.193	4.929	0.740	14.645	0.000
LRA PSV	1.183	0.087		13.571	0.001**
LWT	38.903	15.274		2.547	0.012**

Dependent Variable: Systolic BP **p<0.01

[Table 3] shows the regression model. In the model, LWT and LRAPSV are considered as independent variables while systolic blood pressure is considered as the dependent variable. The systolic blood pressure of the subjects depends on the LWT and LRA PSV as the statistical significance values are below 5 percent level (both p values<0.05). Also, LWT and LRA PSV explain around 74 percent variations in the systolic blood pressure (Adjusted R-square=0.740). Finally, the beta coefficient of LWT reveals that for every unit increase in LWT, 38.903 unit increases in systolic blood pressure is predicted. Similarly, for every unit increase in LRA PSV, 1.183 unit would increase in systolic blood pressure. Hence, the hypothesis '(H1): LRA PSV and LWT are positive relationship with systolic BP' is Valid.

The statistical model is given below:

Systolic BP = 1.183 (LRA PSV) + 38.903 (LWT) +72.193.

Hypothesis (H2): RRA PSV and RWT are positive relationship with systolic BP.

Table 4: Predicting systolic BP with the assistance of RRA PSV and RWT.

Predictors	Unstandardized Coefficients		Adjusted R-square	t-value	p-value
	Beta (β)	SE			
(Constant)	59.659	5.330	0.684	11.194	0.000
RRA PSV	1.753	0.157		11.198	0.001**
RWT	40.060	16.411		2.441	0.016*

Dependent Variable: Systolic BP **p<0.01, *p<0.05

Association between systolic blood pressure, RRA PSV and RWT is shown in [Table 4]. In the statistical model, systolic blood pressure is defined as a dependent variable while RWT and RRA PSV are defined as independent variables. From the statistical significance (p- values<0.05), it is inferred that systolic blood pressure depends on the RRA PSV and RWT. In addition, the independent

variables explain around 68 percent variation in the value of systolic blood pressure (Adjusted R-square: 0.684). Hence, the hypothesis '(H2): RRA PSV and RWT are positive relationship with systolic BP' is Valid.

On the basis of the beta coefficients, the statistical model can be created in the following manner:

Systolic BP = 1.753 (RRA PSV) + 40.060 (RWT) +59.659.

Hypothesis (H3): LRA EDV and LWT are positive relationship with diastolic BP.

Table 5: Predicting diastolic BP with the assistance of LRA EDV and LWT.

Predictors	Unstandardized Coefficients		Adjusted R-square	t-value	p-value
	Beta (β)	SE			
(Constant)	26.231	5.864	0.519	4.473	0.000
LRA EDV	5.211	.592		8.804	0.001**
LWT	56.071	14.275		3.928	0.001**

Dependent Variable: Diastolic BP; **p<0.01

From the [Table 5], it is noticed that LWT and LRA EDV do the significant influence on the diastolic blood pressure. Since, the statistical significance values are below 5 percent level (both p values<0.05). As per the coefficient of determination (Adjusted R-square=0.519), LWT and LRA EDV explain around 52 percent variations in the diastolic blood pressure. Finally, the beta coefficient of LWT depicts that for every unit increase in LWT, 56.071 unit increase in diastolic blood pressure is predicted. Similarly, for every unit increase in LRA EDV, 5.211 unit will increase in diastolic blood pressure. Hence, the hypothesis '(H3): LRA EDV and LWT are positive relationship with diastolic BP' is Valid.

The statistical model is given below:

Diastolic BP = 5.211 (LRA EDV) + 56.071 (LWT) + 26.231.

Hypothesis (H4): RRA EDV and RWT are positive relationship with diastolic BP.

Table 6: Predicting diastolic BP with the assistance of RRA EDV and RWT

Predictors	Unstandardized Coefficients		Adjusted R-square	t-value	p-value
	Beta (β)	SE			
(Constant)	42.795	4.523	0.579	9.463	0.000
RRA EDV	4.302	0.427		10.080	0.001**
RWT	28.378	13.217		2.147	0.034*

Dependent Variable: Diastolic BP; **p<0.01, *p<0.05

Association between diastolic blood pressure, RRA EDV and RWT is shown in [Table 6]. In the statistical model, diastolic blood pressure is defined as a dependent variable while RWT and RRA EDV are defined as independent variables. From the statistical significance (p- values<0.05), it is inferred that diastolic blood pressure depends on the RRA EDV and RWT. Also, the independent variables such as RRA EDV and RWT explain around 58 percent variation in the value of diastolic blood pressure (Adjusted R-square: 0.579). Therefore, the hypothesis '(H4): RRA EDV and RWT are positive relationship with diastolic BP' is valid. On the basis of the beta coefficients, the statistical model can be writtenin the following manner:

Diastolic BP = 4.302 (RRA EDV) + 28.378 (RWT) + 42.795.

DISCUSSION

Ambulatory BP monitoring provides a more reliable measure of a patient's BP than isolated clinic measures and is useful for monitoring BP in patients with labile hypertension, poor control despite using appropriate antihypertensive therapy;[6,7] worsening end-organ damage, in patients where rigorous control of blood pressure is essential, and in cases of suspected syncope or orthostatic hypotension, in patients with symptoms or evidence of episodic hypertension and to detect 'white-coat effect.[3-4]

According to Tolonen et al.[11] several factors affect BP measurement such as environmental factors, vigorous physical activity, heavy meal or smoking before measurement, cuff size, calibration error, left vs. right arm, supine vs. sitting, and these results in variations from 1–2 mmHg up to 20–50 mmHg in individual measurements.

While clinic measurement of BP is useful for screening, and in the management of suspected and true hypertension, ambulatory BP and home BP measurements add considerably to the accurate diagnosis of hypertension and the provision of optimal care. The Newer measurement techniques use different algorithms to measure the Blood pressure and work on the principles of Auscultation (Korotk off sounds), Cuff oscillometry, which relies on detection of cuff pressure oscillations and volumetric oscillometry using detection of volume pulsations under a cuff.[8] All these techniques use the vascular phenomenon of wave form transmission to detect blood pressure.

In a study on new born infants Blood flow velocity in the major cerebral and renal arteries was related to blood pressure.[9] Another study found that there was a significant relationship between Dental pulp blood flow velocity and systolic blood pressure.[10] We hypothesized that if blood pressure influences blood flow velocity then it should be possible to predict Blood pressure based on the Blood flow velocity provided the factors influencing pressure and flow velocity remain constant. We have not used vessel diameter in this model because at any given instance the diameter remains same. However, blood pressure may be influenced by the pliability of the vessel wall for the same diameter in different individuals at a given instance hence the thickness of the wall was included.

Systolic BP = 1.183 (LRA PSV) + 38.903 (LWT) +72.193
Systolic BP = 1.753 (RRA PSV) + 40.060 (RWT) +59.659
Diastolic BP = 4.302 (RRA EDV) + 28.378 (RWT) + 42.795
Diastolic BP = 5.211 (LRA EDV) + 56.071 (LWT) + 26.231

This statistical model allows for the study of both normal and pathological variations of blood pressure at the right arm. It may be also used to monitor rapid changes in blood pressure dynamics resulting from ventilatory or pharmacological manipulation, or from clinical deterioration.

The new clinical guideline for hypertension from the National Institute for Health and Clinical Excellence considers an interarm difference of less than 10 mm Hg to be normal and attributes a difference of more than 20 mm Hg to underlying vascular disease. Although there is inter-arm variability accommodated within this statistical model it cannot be used to predict inter-arm variability of blood pressure. The reason being that the blood flow velocities of the right radial artery and the blood flow velocities in the left radial artery both predict only the blood pressure at the right arm. This is an inherent weakness in this model. However this statistical model could be used as an early step in modeling blood pressure from Blood flow velocities in the development of ambulatory blood pressure monitors.

CONCLUSION

In summary, the statistical model developed from our study indicate the possibility of modeling and predicting blood pressure on the right arm using the blood flow velocities measured at the right radial artery and the left radial artery with their respective vessel wall thickness. Although there is inherent weakness in the predictability of interarm blood pressure variation yet it is encouraging to have a working statistical model as an initial step in predicting blood pressure using blood flow velocities in the development of ambulatory blood pressure monitors.

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EEG Spikes and Sharp Waves as a Guide to Anti-Epileptic Drug Therapy in Patients with Chronic Headache. A Retrospective Observational Analysis.

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ABSTRACT

Background: Purpose: Indiscriminate use of anti-epileptic drugs (AED) in all patients with chronic headache exposes the non-responders to harmful side effects. This retrospective study was aimed to find a common factor identifying patients with chronic headache who specifically benefited from AED therapy. **Methods:** The medical records of 100 cases with chronic headache were analyzed. Patients with history of birth asphyxia, migraine, head trauma, epileptic attacks (past/recent, of any type), psychiatric illnesses, stroke, intra cranial space occupying lesion and ophthalmic problems were excluded. Those who did not respond to analgesics and exhibited spikes and sharp waves in their EEG were treated only with AEDs and followed for 12 months after which a repeat EEG was done. **Results:** Patients were in the age group between 10-50 years. Headache duration varied from 4 months – 7 years. 65% had abnormal EEG findings. Among these patients, 93% (61 patients) had active epileptic activity in the form of spikes and sharp waves, and 7% had diffuse slow waves. These 61 patients were treated with AEDs for 12 months (12 patients lost to follow-up) 43 had improvement in their symptoms. **Conclusion:** Patients with chronic headache presenting with subclinical epilepsy on EEG with sharp waves and spikes benefitted most from AED therapy in terms of duration and frequency of episodes. We propose that all patients with chronic headache be screened with EEG for subclinical epilepsy and then start on AED only for those who exhibit epileptiform activities.

Keywords: Chronic headache, EEG, Spike and Sharp waves, Anti-epileptic therapy.

INTRODUCTION

Chronic Headache is common and related to stress. More than 40% adult world population suffer from chronic headache.[1] Often migraine and chronic headache are used synonymously though there are differences in criteria. Silberstein devised the "International Classification of Headache Disorders" ICHD-II - criteria to classify headaches.[2] Individuals who suffer from chronic headache show decreased productivity, depression, and often behavioural abnormalities.[3]

The success rate in the treatment of chronic headaches is not very encouraging due to the difficulty in pinpointing the exact aetiology, consequently giving rise to a plethora of treatment options with varying effects. Treatment with analgesics is the most common initial approach however often without sufficient relief of pain.

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Treatment with antidepressants has gained much importance in recent times as it is not only effective in treating the pain but also in preventing future attacks.[4] Other modalities which have been successfully tried are the cognitive behavioural therapy and the biofeedback and relaxation therapy.[5,6] Some of the recent modalities in treatment include acupuncture,[7] occipital nerve stimulation and treating certain specific trigger region over the face.[8,9]

Currently anti-epileptic drugs (AEDs) have gained major importance in the treatment of chronic headache, due to its efficacy in preventing attacks. Some of the commonly used anti-epileptics are valproate, topiramate and gabapentin. They act mainly by modulating gamma-amino butyric acid (GABA) and /or glutamate-mediated neurotransmission.[10] A review by Pappagallo has shown that newer antiepileptic drugs have better tolerance and drug interactions than treatment with standard tricyclic antidepressants.[11] This has made the AEDs popular as a preferred treatment of choice for chronic headaches.

Although the AEDs were tolerated by the patients it is not without side effects. Some patients withdrew from treatment because of severe cognitive effects.[12] Indiscriminate use of AEDs in all patients with chronic headache may expose them to these effects and make them noncompliant to treatment. This retrospective study was aimed to find a common factor identifying patients with chronic headache who benefited from AED therapy. This would be later developed as a guide in the selection of patients for AED therapy.

MATERIALS AND METHODS

This is a retrospective study analysing records of 100 (n=100) patients with complaints of chronic headache and follow-up [Figure 1]. The study patients were diagnosed to have frequent episodic or chronic tension type of headache using the ICHD II criteria for chronic headache. The duration of headache varied from four months to a maximum of seven years. Study population included both male (20%) and female (80%) subjects. The age group of the study population varied from 10-50 years (Mean = 28 yrs).

Patients with history of birth asphyxia, head trauma, ophthalmic aetiology like refractory errors, glaucoma, psychiatric illnesses, stroke, intra cranial space occupying lesions and history suggestive of migraine were excluded from the study. Those with history of any form of epileptic attack in the past, family history of epilepsy, or taking AED for any other reason were also excluded from the study.

An EEG investigation was done for patients whose headache persisted even after a course of analgesics. The EEG was analysed by a neurologist. Only those patients showing epileptic abnormalities (spikes and sharp waves) were treated with AEDs. The patients were reviewed after twelve months for symptomatic relief and an EEG was repeated.

Statistical analysis was done using Z test for proportion. (All the data like patient details, treatment history, EEG reports and follow up history after treatment were obtained from patient charts.)

RESULTS

Of the 100 patients 65% (n = 65: 15 male and 50 females) of the study population showed abnormal EEG findings (p value 0.03) [Figure 2]. Among them 93% (n=61: 13 male and 48 females) had evidence of active epileptiform activity in the form of spikes and sharp waves and 7 % (n = 4) exhibited diffuse slow waves [Figure 3].

These 61 patients were treated with AEDs and had no other intervention. They were followed for the next twelve months. 12 patients did not report for the follow-up consequently only 49 patients were available for follow–up analysis. Among these 49 patients, 43(87%) reported significant reduction in intensity and the frequency of headache episodes (p value 0.02) following treatment and 6 (12%) patients reported no improvement [Figure 1]. Out of the 43 patients who had symptomatic relief from headache, 32 patients (74%) (p value 0.08) repeat EEG exhibited no spikes and sharp waves and 11 (25%) retained these changes even after their symptomatic relief.

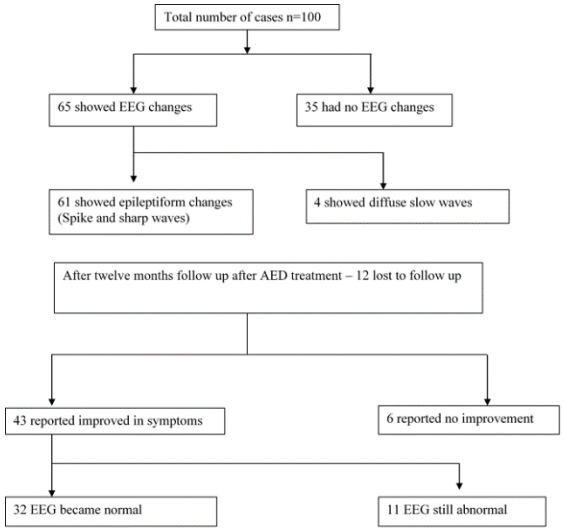

Figure 1: Schema and flow of the study.

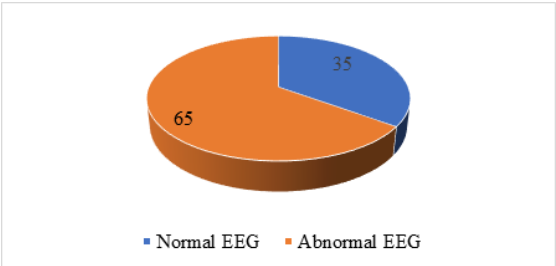

Figure 2: EEG findings of the study population (n=100)

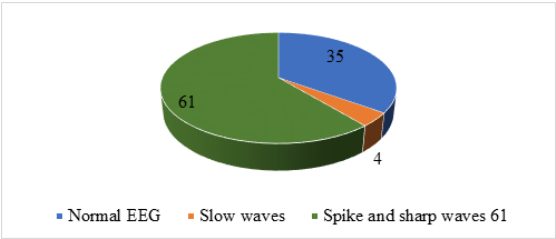

Figure 3: Type of waves seen in EEG of the study population (n=100)

DISCUSSION

The novel finding from our study is that, considerable number of patients with history of chronic headache have spikes and sharp waves in their EEG. This finding is in correlation with the findings of Ziegler and Torres who found spike potentials in the EEG of a 6-year-old girl with history of chronic headache.[13] Other studies have found Spike potentials in non-epileptic patients which were limited to the subcortical structures and did not express as a frank epileptic attack. This

phenomenon was termed as subclinical or masked epilepsy.[14] Subclinical epilepsy can cause much physical and mental impairment to the individual. Some of the documented effects of the spike waves are hyper activeness in autism,[15] regression in pervasive developmental disorders and cognitive impairment.[14]

AEDs act by enhancing GABA mediated inhibition in non-epileptic conditions. Other actions include inhibition of GABA metabolism and facilitation of GABA receptors.[10] These actions help in reducing and regulating excessive neuronal activity in the brain.

We did not find studies looking at patients with chronic headache, specifically benefiting from AEDs, however there were many studies which looked at prevention of episodes of headache with AEDs. Many patients after AEDs experienced side effects such as paraesthesia, cognitive effects, and dizziness without much relief from pain.[12] The adverse effects and the limited beneficial effect of AEDs demand the need for selecting the patients who would receive maximum benefit with AED therapy for their chronic headache.

Our study finds that 61 out of 100 patients with chronic headache exhibited Spikes and sharp waves on the EEG an indication of subclinical epilepsy. This could have manifested as chronic headache and not as an epileptic attack possibly because these waves were limited to the subcortical regions. This also explains why they did not respond to analgesics. After twelve months of follow-up 43 out of 49 patients treated with AEDs (12 lost to follow up from the total 61 treated) showed improvement in their symptoms in terms of intensity and frequency of head ache attacks. In 32 out of these 43 patients, their repeat EEGs showed normal patterns with complete resolution of spikes and sharp waves. This probably is due to reduction in the excessive neuronal discharge which could have been the cause for headache. This reduction in excessive neuronal discharge may be due to the action of AEDs via GABA mediated inhibition.

Based on our findings from this study we conclude that those patients who present with sharp waves and spikes on EEG most benefited from AED therapy for chronic headache. We propose that all patients with chronic headache be screened with a non-invasive EEG and only those presenting with epileptiform activity with spikes and sharp waves be chosen for AED therapy. Other forms of treatment may be tried for patients who did not show epileptiform activities.

Limitations of this study: This is a retrospective observational study with its limitations. Our patients (35) without any EEG abnormality could have been used as controls, treated with AEDs and further evaluated for symptom relief. From the 49 people who were available for final analysis 6 did not have symptomatic relief which may be non-responder which again is speculative. Also from the 43 patients who had symptomatic relief there were 11 who did not return to normal EEG pattern and we are unable to explain this. Prospective randomized control studies and better follow up of patients could shed more light on the effectiveness of AEDs in treating chronic headache. If conclusive evidence could be found using the rationale of AED in patients with underlying EEG abnormality, selecting the patients with chronic headache for AED treatment could be done and indiscriminate use of AED could be avoided.

CONCLUSION

Based on our findings we recommend that all patients with chronic headache be screened for subclinical epilepsy with an EEG. Only those who present with evidence of subclinical epilepsy on EEG should be initiated on AED therapy. Indiscriminate use of AEDs in all Patients with chronic headache should be discouraged and avoided.

Abbreviations

- AED – Anti-Epileptic Drug
- EEG – Electroencephalogram
- GABA – Gamma Amino Butyric Acid
- ICHD – International Classification of Headache Disorders

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Original Article

Assessment of Aerobic Power (Vo_2 Max) in Different Group of Athletic Females in Relation with Body Mass Index and Hemoglobin

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ABSTRACT

Introduction: Vo_2 max is one of the most important indicator of determining cardiopulmonary fitness. The present study was done to find out whether exercise training improves Vo_2 max and if so, among which sports group the highest value was observed. The relationship of height, weight and hemoglobin level on Vo_2 max was also studied.

Aim & objectives:

1. To assess and compare the maximal oxygen uptake (Vo_2 max) in different groups of athletic females.
2. To find out the relationship between Vo_2 max, BMI and Hemoglobin concentration in different groups of female athletes.

Materials & Methods: This study was conducted in the physical education department. Randomly selected Forty trained female athletes, between 18-25 years of age without any medical illness were included in the study group which was subdivided into four groups (Volleyball, Basketball, Khokho & Ball badminton) consisting of 10 in each group. Control group consisted of untrained females of the same age group. Vo2 max was determined using Bruce protocol in a treadmill test.

Results: Mean value for the Vo_2 max was found to be less in Control (23.065ml/Kg/min) compared to Study group ($p<0.001$) and among athletes, Vo_2 max was more in the basket ball (36.367ml/Kg/min) players with the maximum height (163.1cm) than other groups . Hemoglobin values were less in study group compared to the control group (p value < 0.001) No significant difference was observed in BMI between the control and study groups.

Conclusion: Endurance training as well as height significantly influences the aerobic power than the BMI & Hemoglobin concentration.

Key words: Athletes, females, Vo_2 max, BMI, Haemoglobin level

INTRODUCTION:

Exercise is a bodily activity that enhances or maintains the physical fitness and overall health and wellness. It is performed for various reasons including strengthening of muscles and heart, improving athletic skills, weight maintenance, as well as for the purpose of enjoyment. Frequent and regular physical exercise boosts the immune system and prevents the occurrence of heart disease & Type 2 diabetes.

Regular exercise, by increasing flow of blood to various organs of the body, delivers more oxygen, nutrients and thereby improves functioning of the vital organs .The Physiological variables which influence athletic performances are: Vo_2 max, running economy and anaerobic threshold.[1]

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One of the most important predictors of endurance performance is Vo_2 max.[2] Aerobic power or Vo_2 max which involves a full functional support from cardio respiratory and metabolic pathways is an appropriate test to study cardio pulmonary fitness. The term "Vo2" is derived from V-volume of o_2-oxygen. Vo_2 max is the maximum volume of oxygen in milliliters that the body can consume in one minute per kilogram of body weight during intense, whole-body exercise. Those who are fit have higher Vo_2 max values and can exercise more intensely than those who are not as well conditioned.

As exercise intensity increases so does the oxygen consumption. However, a point is reached where exercise intensity can continue to increase without the associated rise in oxygen consumption. The point at which oxygen consumption plateaus defines the Vo_2 max or an individual's maximal aerobic capacity. Aerobic power, aerobic capacity and maximal oxygen uptake are all terms used interchangeably with Vo_2 max.

Vo_2 max averages about 33-36 ml/kg/min in active healthy women in the age group of 20-29 years. It is lower in sedentary individuals (less than 23.6 ml/kg/min).[3] Training increases the maximal oxygen consumption (Vo_2 max) which is the product of maximal cardiac output and maximal O2 extraction by the tissues. It is well established that Vo_2 max is higher in female athletes when compared to female non-athletes.[4] The present study was done to compare the Vo_2 max of different group of athletes.

Maximum Vo_2 varies with age, gender, weight and height.[5] Studies on the effect of body mass index on Vo_2 max had shown controversial results. Body Mass Index (BMI) is used for screening the health of the general population as there is a strong correlation between being overweight or obese and having health problems, chronic diseases and premature death. Increased BMI levels have also been associated with decrease in respiratory and cardiovascular system capacity resulting in decreased Vo_2 max.[6] Increased BMI was also found to increase Vo_2 max in physical education students.[7]

Vo_2 max was affected by hemoglobin concentration which determines the oxygen carrying capacity of the blood. In trained individuals it was expected of them to have high hemoglobin concentration as training increases Vo_2 max.

Hence the present study was done not only to compare the Vo_2 max of different athletic groups, but also to find out the relationship between BMI, Height and Hemoglobin concentration on Vo_2 max in trained female athletes.

AIM AND OBJECTIVES:

Aim:

To assess the maximal oxygen uptake (Vo_2 max), Body Mass Index (BMI) and Haemoglobin level in different groups of athletic females.

Objectives:

1. To compare Vo_2 max of female athletes in different groups like basket ball, volley ball, Kho-kho and ball badminton.
2. To compare Body Mass Index of female athletes in different groups like basket ball, volley ball, Kho-kho and ball badminton.

3. To compare Haemoglobin levels of female athletes in different groups like basket ball, volley ball, Kho-kho and ball badminton.
4. To find out the relation between Vo_2 max, Body mass index & Haemoglobin among athletes and control.

MATERIALS AND METHODS:

The present study is a comparative study conducted in the physical education department, in a private medical college in Tamilnadu over a period of 3 months after obtaining the Institutional Human Ethical Committee clearance. A total number of 50 subjects were selected randomly from Physical education department.

Study group included forty trained, randomly selected female athletes in the age group of 18-25 years who were subdivided into four groups, consisting of 10 members in each group. Athletic females who were representing university sports team such as Volley ball, Basket ball, Khokho and Ball badminton were selected for the study, after obtaining informed written consent from each individual.10 athletes were selected from volleyball team, 10 from basketball, 10 from khokho and the remaining 10 from ball badminton team.

Control group included 10 non athletic females of the same age group from Rajah Muthiah medical college, who had no particular athletic background. Healthy female athletes who have been involved in sports activities for more than 2 years were included in the study. Female athletes below 18 and above 25 years, those having history of cardiac, respiratory or neuromuscular diseases and with irregular training were excluded from the study.

Data Collection Method And Tools:

Baseline and endline data were collected using a questionnaire. Experiment was conducted in the evening on every day. Vo_2 max, BMI & Haemoglobin levels were measured initially and then after the treadmill test.

Vo_2 max was estimated using a Bruce protocol.[8] The Bruce Protocol is a maximal exercise test where the athlete works to complete exhaustion as the treadmill speed and incline is increased every three minutes. Because this is a maximal exercise test, this test was performed with reasonable safety accommodations and supervision. The length of time on the treadmill is the test score and can be used to estimate the Vo_2 max value.

Treadmill Test:

Individuals had to run on a treadmill with a starting slope of 0 degree and a speed of 1.7 miles/hr (11 km/hr). The slope was increased at the end of every 3 minute (without taking a pause in the run), till the person is no longer able to continue and the time spent on running was recorded.

Bruce Treadmill Test Stages

Stage 1 = 1.7 mph at 0% Grade
Stage 2 = 1.7 mph at 5% Grade
Stage 3 = 1.7 mph at 10% Grade
Stage 4 = 2.5 mph at 12% Grade
Stage 5 = 3.4 mph at 14% Grade
Stage 6 = 4.2 mph at 16% Grade
Stage 7 = 5.0 mph at 18% Grade
(mph – miles / hour)

From the total run time an estimate of the athlete's Vo_2 max was calculated as follows:

$$\text{For women } Vo_2 \text{ max} = 4.38 \times (T - 3.9)$$

"T" is the total time of the test expressed in minutes and fractions of a minute

Procedure:

1) The assistant sets the treadmill to a speed of 1.7 miles/hour with a slope of 0°.
2) The athlete warms up for 10 minutes.
3) The assistant gives the command "GO", starts the stopwatch and the athlete commences the test.
4) The assistant, at 3 minutes intervals, adjusts the treadmill slope as per the table below.
5) The assistant stops the stopwatch when the athlete is unable to continue.

Body Mass Index (BMI):

BMI is defined as the individual's body weight divided by the square of his or her height. Formula: Weight (kg) / Height (m^2). Weight was recorded in kilograms by using a locally made, calibrated, electronic weighing scale, accuracy +/ - 0.01 kg. Height was measured in centimeters while standing erect. Reading was taken nearest to 1 cm by using inch tape.

Blood Hemoglobin level was estimated using Sahli's Haemoglobinometer based on colour comparison.

RESULTS:

In this study, 50 females between the age group of 18 to 25years were selected for assessment of Vo_2 max, in that 40 were trained athletes (each group consists of 10 people) & 10 were controls.Analysis of results were done using Bonferroni multiple comparison test.

Table 1- Comparison of Vo_2 max by grouping

GROUPS	Mean ml/kg/min	Standard Deviation	ANOVA	p Value	Bonferroni multiple comparison test
Volley ball	32.539	4.221	14.290	<0.001	Control Vs All
Basket ball	36.367	5.034			
Khokho	32.999	4.140			
Ball badminton	31.978	4.205			
Control	23.065	2.835			

Table 1 indicates that there is a significant statistical difference ($p < 0.001$) between the control and study group regarding Vo_2 max. It shows that due to training Vo_2 max is more among athletes compared to the controls.

Table 2- Comparison of Height by grouping

GROUPS	Mean (Cms)	Standard Deviation	ANOVA	p Value	Bonferroni multiple comparison test
Volley ball	158.9	6.640	3.268	0.020	Control vs Basket ball
Basket ball	163.1	6.045			
Khokho	159.1	3.784			
Ball badminton	156.7	3.056			
Control	155.8	4.237			

From the table 2 it is inferred that, Vo_2 max values of the basketball players increased in relation with height of the individuals, when compared to other sports persons and control group.

Table 3- Descriptive statistics of Body Mass Index (Kg/m2) by grouping

Values	Volley ball (n:10)	Basket ball (n:10)	Kho kho (n:10)	Ball badminton (n:10)	Control (n:10)
Minimum	17.100	18.200	17.900	18.500	18.000
Maximum	24.700	27.100	29.000	28.600	29.500
Mean	19.540	20.990	20.890	21.480	22.640
Standard deviation	2.241	2.916	3.444	3.068	3.596

The mean value for the Body mass index in control group is 22.640 and among athletes it is least in volleyball players (19.540). Basketball and khokho players have more or less the same BMI values (20.990) & (20.890) respectively. Table 3 doesn't show any statistical difference in BMI between control group and athletes.

Table 4- Comparison of blood Hemoglobin level by grouping

GROUPS	Mean (G/dl)	Standard Deviation	ANOVA	p Value	Bonferroni multiple comparison test
Volley ball	11.080	1.424	5.387	0.001	Basket ball versus Control & Volleyball
Basket ball	8.720	1.402			
Khokho	9.960	1.551			
Ball badminton	9.860	1.276			
Control	11.340	1.506			

Table 4 shows a significant difference ($p<0.001$) between control and study group regarding hemoglobin levels.

DISCUSSION:

Maximal exercise test with direct measurement of oxygen uptake is considered the most accurate method of assessing aerobic power. Exercise stress testing is most commonly carried out using a Treadmill. In the present study, Vo_2 max of athletic females engaged in different sports were compared with each other and also with that of controls. Age matched female subjects were chosen for this study as Vo_2 decreases with age.[9]

The result according to Table 1 states that Vo_2 max is more in athletic females (<0.001) when compared to the control group. This result suggests that endurance training has a beneficial effect on increasing the Vo_2 max values. Earlier studies also have observed similar findings[10]. This can be explained on the basis of many physiological alterations which occur in the body as a result of long term regular exercise.

There is ample of evidence that training can improve the performance of muscles by many adaptations, including increased density of the capillary network in the skeletal muscles increasing the capacity to irrigate muscles with blood.[11] The changes that occur include over expression of PGC-1α resulting in increase in the number of mitochondria and the enzymes involved in oxidative metabolism.[12] The net effect is more complete extraction of O_2 and consequently, for a given work load, less increase in lactate production. In healthy untrained subjects, rapidly increasing lactate levels normally limit exercise tolerance.[13] Less lactate released by the muscles and excess ventilation, together with an increase in the tolerable minute volume, combine to increase the Vo_2 max. Regular training increases Vo_2 max by increasing cardiac output secondary to increase in stroke volume and an increase in arterio venous oxygen difference.[14]

Regarding Vo_2 max among athletes, the values were highest in Basket ball players (Mean : 36.367). The second highest values of Vo_2 max were recorded in Khokho players. (Mean : 32.999). The lowest values of Vo_2 max were recorded in Ball badminton players, and the mean was 31.978.

Basketball is a fast paced, high energy expenditure game when compared to other games that require endurance, speed, strength and hand-eye coordination[15]. In a comparative study done on physical fitness of football, volleyball, basketball and hockey players, next to the football players higher level of Vo_2 max was observed in basket ball players.[16]

In the present study, the highest Vo_2 max values (p value < 0.020) observed among Basketball players compared to others were found to correlate with their height (Table 2-mean:161.3cms) and this could be due to the increase in the vertical diameter of the lungs, which aids in increased minute volume. Previous studies had observed a similar significant correlation between height and Vo_2 max in young girls as well as in male swimmers and they attributed this to be due to greater lean body mass and larger lung size in tall individuals.[17,18]

Table 3 shows that the Body mass index is high in control group (mean=22.640), when compared to the study group but statistically there is no difference between control & study group. Among study group it is comparatively less in volleyball players & more in Ball badminton players. The Basketball and kho kho players have more or less the same Vo_2 max values.

One of the problems associated with Body Mass Index is that there is no way to know if the person is heavily muscled or overweight. Therefore, body fat percentage has been recently recommended as a more accurate measurement of body fatness.[19] The present study result can be explained on the basis that athletes have more muscle mass contributing to the Body mass index, when compared to controls, where it may be contributed by fat.

There were mixed results regarding BMI and Vo_2 max.[20,21] A negative correlation was observed between BMI and Vo_2 max and that fitness level decreased with increasing body weight. The proposed mechanism could be that with BMI more than 30, the minimum classification for obesity, the functional residual capacity of the lungs is reduced by 25 percent, expiratory reserve volume is reduced by over 50 percent and decline in several measurements of cardiovascular function are observed. While these functional measurements are not heavily involved in normal breathing, they do drastically limit the lungs' capacity for achieving maximum work and will result in lowered Vo_2 max values.

Few other studies done to assess the relationship between body fat and Vo_2 max have concluded that obese females are as fit as non obese females and they do not have less Vo_2 max.[22,23] It was found that in a 14 days fitness programme, the absolute Vo_2 max was higher in obese than in normal weight women.

The present study result coincides with the results of the study done on Vo_2 max and body fat percentage in female athletes where Negative correlation was there between Vo_2 max and body fat percentage but was not statistically significant.[24]

Regarding hemoglobin levels, (Table 4) the control group has the highest value (mean=11.340 g%). Among study group volleyball players has the high hemoglobin values, in khokho & ball badminton players it is more or less same, while Basketball players has the low hemoglobin values. A negative correlation was observed between basketball players and all the other groups on hemoglobin & Vo_2 max.

A reduction of blood hemoglobin concentration characretized by decreased O_2 carrying capacity of blood is expected to decrease Vo_2. In the present study, the basket ball players exhibiting highest Vo_2 max among all the other groups have low blood hemoglobin. This could be due to expansion of plasma volume in trained individuals caused by

translocation of fluid from the interstitial compartment and increased albumin synthesis by the liver. The plasma volume expansion is greater than the red blood cell expansion and thereby hemoglobin concentration decreases (Sports or pseudo anaemia). [25,26]

True anaemia in athletes could be due to iron deficiency, exertional hemolysis, and exercise related gastro intestinal bleeding. It was also reported that Vo_2 max is limited by the availability of O_2 and not by the increase in hemoglobin with altitude acclimatization.[27] During maximal exercise neither peak cardiac output nor peak leg blood flow are affected by reduced hemoglobin.

From the above reports, it was observed that Vo_2 max values were higher in athletes. BMI has no significant difference between study & control groups. It is also observed that along with endurance training, height of the individual also influences the aerobic power.

CONCLUSION:

In the present study, we have concluded that, compared to control group, aerobic power (Vo_2 max) is increased in athletes. Among athletes, Vo_2 max is increased in basket ball players, when compared with Volleyball, Kho kho & Ball badminton players.

Vo_2 max in the Basket ball players is mainly influenced by endurance training and height of the individual, than the lean body mass. Low Haemoglobin concentration observed in athletic group could be due to sports anaemia. Despite the limiting factors, improving Vo_2 max scores is possible, if an appropriate exercise or training regime is followed.

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WE WISH YOUR OPINION

Gender Differences on the Effect of Non-HDL-C on Blood Pressure, Blood Flow Velocities and Arterial Wall Thickness; An Observational Analysis in Madurai Population

Rajpathy, John; Mariappan, M.; Anto, J. Vijay.

Article | IMSEAR | ID: sea-187700

ABSTRACT

Background:

Non-high density lipoprotein cholesterol has been shown to be a predictor of initial coronary heart disease events and arthrogenic. Women from Madurai have been shown to develop dyslipedemias from an early agerequiring surgical intervention when compared to women from other regions of India. This observational study was undertaken to find if the women had a higher risk for CHD when compared to men from the same region.

Methods:

50 subjects (n=50) were inducted into this study with 26 (52%) of them were males and 24 (48%) of them were females.Patients with significant past history of major illness were excluded, including dyslipidemias, Diabetes mellitus, hypertension, myeloproliferative disorders, cardiac diseases and alcohol addiction. Blood lipid profile, Pulsed Doppler profile of right brachial artery blood flow velocities, Brachial arterial wall thickness, Blood pressure were measured.

Results:

In males there was significant correlation between Non HDL–C peak Systolic velocity (PSV), wall thickness (WT) and systolic Blood pressure (SBP) ($P< 0.01$) and End diastolic velocity (EDV) ($p<0.05$). Females in addition correlated significantly with diastolic blood pressure (DBP) ($p<0.05$) and without correlation with EDV. Total cholesterol (TC) in males were significantly correlated to PSV, EDV, WT and SBP ($p<0.01$). In females TC was significantly correlated to PSV, WT and SBP ($P<0.01$) and with DBP and Age ($P<0.05$).

Conclusion:

Our results show that females in Madurai develop higher risk for CHD from an early age than men because, Non-HDL-C was correlated significantly with SBP and DBP, SPV and WT, where as in men there was no correlation with DBP, and TC was additionally correlated significantly with DBP and Age in females and not in males. Early intervention with life style changes, Dietary modifications and exercise program may mitigate these risk factors for CHD.

Arterial wall thickness; Blood flow velocity; Coronary Heart disease; Non-High density Lipoprotein

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Knowlegde, Attitude and Practices Regarding Family Planning Practices and Methods among Women of Urban Slums of Pondicherry City Chennai

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ABSTRACT

Background: Utilization of family planning methods, their side effects and the factors influencing their uses. Aims: To study the family planning practices methods among the married women of reproductive age (15-45 yrs). Study Design: Community based study. Study Subjects: The Women of reproductive age groups (15-45yrs) adopting family planning methods & those residing in urban slums of Puducherry. Sample Size: 540, Study Period: July 2009 to July 2011. Sampling Technique: Thirty cluster sampling. Result: The acceptance of family planning methods both temporary and permanent methods increased with level of literacy of women. About 53.40% adopted I.U.C.D, 38.83% O.C. pills & only 7.77% of their partners used condoms, 66.6% have undergone laparoscopic & 33.4% mini-lap sterilization. Vasectomy was not done for even a single partner. More number of illiterate and primary educated accepted permanent method after 3 or more children than higher educated who accepted it after 1 or 2 children. Among acceptors of permanent methods, total 70.27% were experiencing side effects and among temporary method users, it accounted 23.30%. Conclusions: Acceptance in family planning is associated with increasing age, nuclear family & level of literacy. IUCD is the most accepted one among all the temporary methods. Vasectomy and newer contraceptives were not at all used.

Keywords: *Contaceptives, IUCD, Contraception, need ,urban-slums, practices.*

INTRODUCTION

India is home for three in-famous problems and those pre-fix with letter "P". They are "population explosion", poverty and pollution. Population explosion is directly perpetuating the other two problems. India is among the few countries in the world to accept family planning as a national programme. Operationally Family Planning practices are women-centred and based on two methods/practices, they are permanent and temporary.[1]

In NRHM, the family planning programme is implemented on cafeteria approach and is client-centred, demand-driven and need-based. The need-based or client-centred approach starts from the bottom and the need is calculated from the population in sub-centre by the health workers.[2] So this is otherwise called bottom-up approach. In this present study an attempt has been made to assess the magnitude and distribution of the family planning practices/methods adopted or practiced.[3]

MATERIALS & METHOD

The Antenatal coverage amongst the recently delivered women was found to be 60%. Taking P as 60 as "Concurrent assessment of Health and Family Welfare Programmes and technical assistance to district of Uttar Pradesh" by the Department of Medical Health And Family Welfare, Uttar Pradesh reported the same prevalence and Q as 40 and absolute error (L) 6%, sample size was calculated using the formula.[4] Since respondents are chosen by cluster sampling design effect due to complex sample design comes into picture. Taking into account design effect of 2, the sample size was 532 # 540. The maternal care and other components of the Reproductive and Child Health programme were assessed using 30 cluster sampling technique. Thus for the present study, Probability Proportionate to Size (PPS) method was adopted as the sampling strategy. The study period was from July 2009 to July 2011. The desired number of women to be interviewed in each cluster was 18. In each cluster the first house was

chosen at random and from there on, the next nearest house was visited until the desired numbers of mothers were interviewed. If a household had more than one beneficiary, all were included in the survey. The basic questionnaire of "Concurrent assessment of Health and Family Welfare Programmes and technical assistance to district of Uttar Pradesh" by the Department of Medical Health And Family Welfare, Uttar Pradesh was adopted and reframed as per the requirement of the study.[5]

RESULTS

Socio demographic profile of the contraceptive users

More than half, 334 (61.9%) of the women were Hindu and 200 (37%) were Muslims. Two third of the women, 367 (68%) belonged to SC/ST caste and one third of the women 122 (22.6%) belonged to OBC. A small percentage i.e. only 51 (9.4%) belonged to general caste. About one third, 202 (37.4%) belonged to age group 31-35 years and 158 (29.3%) belonged to age group 20-25 years. About 89 (16.5%) belonged to 26-30 years of age. About half, 282 (52.2%) were illiterate and 153 (28.3%) were educated up to primary level.

Knowledge about contraception

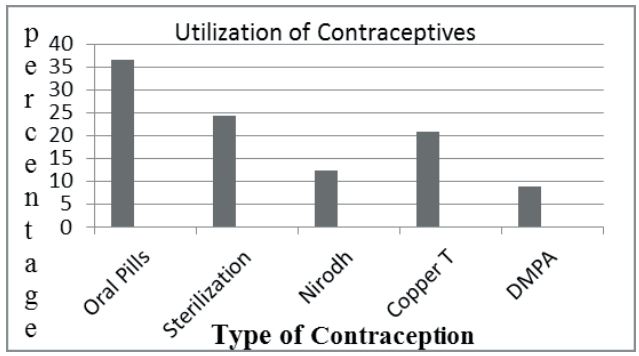
More than half (55.6%) of the women in the study were married before 18 years of age and 44.4% were married after 18 years of age. The distribution of the women according to knowledge of contraception is shown in table.

Table-1: Distribution of women according to Knowledge about contraceptive methods.

Knowledge	No.	%
Knowledge about any contraceptive method (n=540)		
Yes	340	63.0
No	200	37.0
Knowledge about type of contraceptive method (n=340)		
Oral Contraceptive Pills	331	95.7
Nirodh	116	34.1
Copper T	159	46.8
Male Sterilization	182	53.5
Female Sterilization	271	79.7
Injection	4	1.1

Use of contraception method

Figure depicts the distribution of women according to the type of contraceptive method. More than half 226 (66.5%) of the women were currently using contraception and 114 (33.5%) were not using any contraceptive technique even after having knowledge about them. More than half 54% of the women told that their husband were currently using oral pills as a method of contraception 12.2% of the women husband were using Nirodh whereas 24.3% of the women were sterilized and 20.8% were using Copper-T. Very few 8.8% women were using other method of contraception i.e. (DMPA/injections).



Unmet need of Contraception:

Table 2 depicts the distribution of unmet need of contraception of the women. More than one third 52 (45.6%) of the women were in unmet need of contraception. The unmet need was for pills as temporary method and rest of them were having the choice of other conventional contraceptives. Unmet need of family planning turns out to be 57%.

Table-2: Distribution of women according to their unmet need of contraception

Unmet need	**No.**	**%**
Need to use any contraceptive method in future (n=14)		
Yes	52	45.6
No	62	54.4
Preferred method of contraception (n=52)		
Temporary methods		
Oral Contraceptive Pill	18	34.6
Nirodh	8	15.4
Copper T	7	13.5
Injection	3	5.8
Permanent methods		
Female Sterilization	9	17.3
Male Sterilization	1	9.1

Source of Contraceptives :

The study shows the distribution of the source of availing contraceptives by the women. More than one third, 91 (40.3%) availed contraceptives from private health facility while, 55 (24.3%) availed if from government health facility and local shops, remaining 25 (11.1%) were not having any knowledge regarding source of contraceptives.

Reason for non use of contraceptives

Table 3 depicts the reasons for not using any contraceptive technique. About one third 35 (30.7%) opined that the use of contraception was against religion and 20 (17.5%) did not have much knowledge about the safe use of contraceptives. Similar number gave the reason as reluctance of the husband, other reasons were financial constraints, wish to extend family, some of them have no need for contraception and others were not able to give any cause.

Table-3: Distribution of women according to reasons for not using any method of contraception.

Reasons	No. (n=114)	%
Against religious belief	35	30.7
Less Knowledge	20	17.5
Opposition & reluctance of husband	20	17.5
Very costly	12	10.5
Wish to extend family	12	10.5
No need	12	10.5
No response	3	2.7

DISCUSSION

Similar findings were represented in the study done by, Agrawal Shraddha et al (2006). Dinesh and Kalia et al (2008) found the highest awareness ranging from 65-68% regarding contraceptive methods which is corresponding to our observation. The NFHS-3 data shows the findings differently. It shows that 38.4% had knowledge about any method of contraceptives.[6]

In the present study, 66.5% of the women were ever users of contraception where as 33.5% were the never users of contraception. Similar finding were shown by, Bhasin et al (2006), NFHS-3 India, Renjhen (2008). These studies show the usage of contraception between 50%-75%.[7] The findings of these studies match the findings of the present study. Bhasin et al in their study showed that 75% of the subjects were users of any contraceptive method. In the present study 54% of the women told that their husbands were currently using condoms for family planning and 36.6% of the women were using pills. It also shows that 24.3% of the women were sterilized and 20.8% were using copper-T. Very few were using other method of family planning.[8] Similar findings were shown by Bhasin et al (2005), Agrawal Shraddha et al (2006) Condom was the most common method which constituted about 33.4% of contraception followed by oral contraceptive pills, tubectomy and intrauterine device 15.7%. The percentage use of female sterilization was 37.8% followed by 9.8 for condoms, 3.8% for IUD and 3.2% for contraceptive pills. Non acceptors were more in Muslim community.[9] Khokkar and Gulati (2000), Banerjee et al in (2004) found in their studies that low usage of family planning methods is associated with low literacy rate and Muslim community and the present study shows the similar results.[10]

CONCLUSION

NGO involvement with active community participation has to be strengthened for effective implementation of RCH services. Health volunteers and workers under NHUM should be piloted in these urban slums to increase the utilization of maternal health services.[11]

Regular concurrent assessment of the client based perception of the programme to be done so as to improve the quality services provided to increase utilization of the programme.

Ethical Clearance- Taken from Sri Lakshmi Narayan Institute of Medical Sciences Ethical committee.

Source of Funding- Self

Conflict of Interest: Nil

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The Role of Biofeedback Therapy as a Tool for Stress Reduction in Patients Suffering from Chronic Stress

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ABSTRACT

Modern day life is replete with stress, development and increased dependency on technology comes with a baggage of stress. Stress is the major factor responsible for lifestyle related disease. The below study was conducted to evaluate the extent to which stress management could be carried out in subjects of different age groups using biofeedback as a technique for stress management. Biofeedback therapy is a tool in which the subjects are trained how to relax using program generated audiovisual effects which monitor the parasympathetic response as the patient gets more and more relaxed. Biofeedback is a perfect example of mind body interface where the progress made by patient could be accessed by patient himself.

Keywords *: Stress,Biofeedback, Relaxation Therapy (BRT), EEG*

INTRODUCTION

STRESS AND MIND-BODY INTERPLAY

The commonsense notion that 'too much stress makes you sick' might hold more than a grain of truth in modern day lifestyle esp in workers in low key jobs , in which they have high stress and little autonomy, people today have more than twice the risk of developing metabolic syndrome —a precursor of heart disease and diabetes—compared with employees in higher-level jobs (Chandola et al, 2006), By measuring heart rate, and cortisol and adrenaline levels, researchers also found that stress affects the autonomic nervous system and neuroendocrine function (Chandola et al, 2006; Bjorntorp, 1991; Brunner et al, 2002). This aggregates (Brydon et al, 2006) the understanding that emotions affect physical health dates as far back as the second-century In the past 30 years, however, research into the link between health and emotions, behavior, social and economic status and personality has moved both research and treatment from the fringe of biomedical science into the mainstream. According to the mind–body paradigm, there is no real division between mind and body Chronic activation of stress responses by the hypothalamic–pituitary–adrenal axis and the sympathetic–adrenal–medullary axis leads to a permanent overproduction of glucocorticoid hormones and catecholamines (adrenaline and noradrenaline)[1]. Immune modulation by pituitary and adrenal hormones occurs through two pathways: directly by binding hormones to receptors, or indirectly by inducing the deregulation of cytokines, such as tumour necrosis factor (TNF) and interferon-γ (Glaser &Kiecolt-Glaser, 2005). This hormonal activation as well as production of several cytokines in turn lead to activation of the sympathetic nervous activity which produces the different manifestations of stress[2].

BIOFEEDBACK

Biofeedback is a self-regulation technique through which patients learns to voluntarily control what were once thought to be involuntary body processes. This intervention requires equipment to convert physiological signals into meaningful visual and auditory cues, as well as a trained biofeedback practitioner to guide the therapy. Using a screen such as a computer monitor, patients get feedback that helps them develop control

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over their physiology.

Some of the other commonly monitored variables are used when the goal of biofeedback is to reduce sympathetic arousal. These include heart rate, respiration rate, skin surface temperature (at the fingertips), skin conductance and heart rate variability[3]. This physiological information is normally not viewed as being under conscious control, but biofeedback provides real-time data, helping to bring such physiological processes under the control of the patient. Common disorders treated in this way include hypertension, anxiety and medical conditions exacerbated by stress. Biofeedback also helps to make patients aware of the thoughts, feelings and behaviours related to their physiology. Over time, they can learn to self-regulate without feedback screens in front of them.

MATERIAL AND METHOD

The present study was conducted in the dept of psychiatry & physiology M.L.B Medical College ,Jhansi.The participants in the study were patients presenting in the Psychiatric O.P.D who were suffering from long term stress and were willing to participate in the study. At their arrival at the center, the authors, having informed the participants about the aim of the study, asked for their voluntary and anonymous participation, emphasizing that they could withdraw their consent at any time. Both oral and written instructions were given to ensure that the items were understood, and participants were reassured about the confidentiality of their responses.Concent was also obtained from hospital ethical committee

AIM

The aim of this study was to determine whether the use of a biofeedback-based stress management tool (consisting of rhythmic breathing, actively self-generated positive emotions and a portable biofeedback device) helps to reduce stress.

OBJECTIVES

- To study the effectivity of biofeedback in management of stress
- to study the effectivity of b.r.t in different age groups, sexes and education levels

INCLUSION CRITERIA:

- Subjects suffering from long term stress .
- Willing to participate in the study.

EXCLUSION CRITERIA:

- Subjects suffering from any comorbid psychiatric illness like depression,bpd,schizophreniaetc were not included.

PROCEDURE: Both the visual feedback received through a video game-like display portraying a animation and audio feedback with the inclusion of music with changes in frequency, volume, and rhythm enabled the individual to respond by moving toward a better, learned, and voluntary-controlled function as they consciously directed their brainwaves. For feedback control ,baseline alpha wave activity was set as the patient got more relaxed alpha activity increased and a bargraph turned green When subject to relax without falling asleep. In the training session they were first given progressive muscle relaxation exercises along with breath training and instructions to improve positive feedback. Subjects were also required to practice the relevant relaxation and breathing exercises that provided positive feedback daily, preferably at a fixed time of day. The perceived stress scale was administered at initial. Sujects were assigned in four groups according to their age group. Participants received instrument feedback training every week for 3 months.when the alpha activity was above threshold, the animation started and a song played,the animation became more vibrant as the patient relaxed. while the counter accumulated points.

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate by circling how often you felt or thought a certain way[4-7].

Name_____

Date _____Age_____

Gender (Circle): **M** **F**

Other _____

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?..... ..... **0 1 2 3 4**

2. In the last month, how often have you felt that you were unable to control the important things in your life? **0 1 2 3 4**

3. In the last month, how often have you felt nervous and "stressed"? **0 1 2 3 4**

4. In the last month, how often have you felt confident about your abilityb to handle your personal problems? **0 1 2 3 4**

5. In the last month, how often have you felt that things were going your way?..... ..... **0 1 2 3 4**

6. In the last month, how often have you found that you could not cope with all the things that you had to do? **0 1 2 3 4**

7. In the last month, how often have you been able to control irritations in your life?..... ..... **0 1 2 3 4**

8. In the last month, how often have you felt that you were on top of things?.. **0 1 2 3 4**

9. In the last month, how often have you been angered because of things that were outside of your control?..... **0 1 2 3 4**

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? **0 1 2 3 4**

OBSERVATION

The present study entitled "role of biofeedback in stress management",was conducted in the Dept of psychiatry M.L.B Medical College Jhansi.All 100 subjects were accessed for stress level using perceived Stress scale and then biofeedback relaxation therapy was administered to them.

Mean time of completion for sessions was 20 min, with times ranging from 15 to 30 minutes. Forty-three percent of the sessions were completed within20 minutes, with 55% exceeding 20 minutes. Only 2 sessions were completed in less than 15 minutes.

Table No. 1 Reduction of stress in different age groups.

AGE	No. of Subjects	Overall Score SD 1st Session	Last Session	P Value
<30	25	28.2-7.6	19.2-7.6	.0001
31-40	27	30.4-7.7	20.2-7.6	.0001
41-50	26	33.4-8.5	24.2-8.1	.0001
>51	22	33.8-6.5	26.4-6.3	.0001

There was a gradual reduction in stress in all age groups which was significiant. Patient in the age group >50 years had the maximum stress level at the beginning of study ,but following b.r.t maximum stress reduction was found in younger age group 31-40 followed by >40 yr group ,which could be related to effect of aging on cognition and therby b.r.t was most effectively used by younger age group .

Table No. 2 Gender wise reduction of stress.

Gender	No. of Subjects	Overall Score SD 1st Session	Last Session	P Value
Women	56	32.4-7.7	25.2-7.2	.0001
Men	44	30.3-8.6	25.4-7.2	.001

A lowering in stress is seen in both sexes however females who had greater perceived stress at the beginning of study also showed a slightly greater reduction compared to there male counterparts.

Table No. 3 Lowering of stress in educated and uneducated subjects.

Education Level	No. of Subjects	Overall Score SD Ist Session	Last Session	P Value
10th and above	70	32.6-7.2	26.8-7.1	<.001
Uneducated	30	31-8.-7.4	27.6-6.8	<.001

Biofeedback relaxation therapy decreased stress to an equal extend in both educated and uneducated patients and no significiant change in level of stress reduction was found in different education level

DISCUSSION

The ability to generate alpha brainwaves has been associated with the self-regulation of stress (Wacker 1996). Previous studies specifically linked stress and relaxation with EEG recordings (Isotani et al 2001) and found that an increase in alpha frequencies in the frontal scalp area is an indication of positive relaxation training effects of audiovisual stimulation (Teplan et al 2003) and is neuroprotective (Sterman et al 1970). Our study suggests that EEG biofeedback can effectively lower stress, Inconsistencies in the different studies concerning stress reduction could be attributed to the way stress was assessed in individual patients and the actual length of treatment with longer periods of treatment reducing stress more effectively.

Detailed evaluation of each patient undergoing treatment would be a better evaluation of the characteristics and efficiency of the treatment. The Biograph program used for our study only required an electrode to be placed on only one active site in the scalp (C3) for EEG recordings. Most of the other similar studies recorded EEG from more than one active site according to the International 10–20 system. Furthermore, any increase in arousal affects the EEG frequencies in the entire region of the scalp and not just an isolated area (Barry et al 2004). Changes in arousal levels are linked with global activity while specific regional activity is linked with processing[3,8]. Our study of 5 sessions of operant training of EEG activity was sufficient to produce significant changes in stress scores.. A more detailed assessment would be to see the long-term effect of therapy, and evaluate whether a 3-month program could still have positive influence on stress 6months or one year after completion of treatment.

Although training involving EEG activation must be within a consistent therapy situation (Rosenfeld et al 1996), it is difficult to distinguish the effects of EEG training from confounding conditions like drowsiness, medications, caffeinated drinks, changes in emotional state/arousal, artifact from eye movements, time of day, and state of alertness. Therefore, these factors should be taken into consideration to eliminate the possibility of their influence on the positive effects resulting from intervention.

The open and uncontrolled nature of our study militates against firm conclusions. However, the significant reduction in stress scores could lead to a big improvement in the morbidity and mortality rate of these patients as a further reduction was seen even in those scoring normal level scores during initial recruitment.The study suggested a higher level of concentration and alertness for participants as they underwent their relaxation and biofeedback therapy.

EEG biofeedback provides accumulated benefits for some participants. The learning gained by the subjects during their training can be applied in their everyday life, as participants had their eyes open and learnt to stay relaxed while remaining alert and reducing their tendency to fall asleep. Biofeedback may also indirectly assist the participant to be better focused, more in control, and to feel clinically better.

CONCLUSION

The presentstudy titled “Role of Biofeedback Relaxation therapy in stress management”was conducted in the Dept of Psychiatry M.L.B MedicalCollege,Jhansi.

Subjects were taken from the psychiatryO.P.D ,50 consenting subjects were included in the study .The following conclusions were drawn from the study.

1. Following b.r.t maximum stress reduction was found in younger age group 31-40 followed by >40

yr group ,which could be related to effect of aging on cognition and therby b.r.t was most effectively used by younger age group .

2. A lowering in stress is seen in both sexes however females who had greater perceived stress at the beginning of study also showed a slightly greater reduction compared to there male counterparts.

3. Biofeedback relaxation therapy decreased stress to an equal extend in both educated and uneducated patients and no significiant change in level of stress reduction was found in different education level

Ethical Clearance: Present Sutdy was approved by institutional and review committee, MLB Medical College Jhansi, U.P India

Conflict of Interest- Nil

Source of Funding - Self

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Impact of BMI on Visual Reaction Time in Individuals with BMI in Normal Range

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ABSTRACT

Background – Reaction time provides an opportunity to assess the processing capabilities of the nervous system. It is affected by several factors, some of which are related to the stimuli, while others to various aspects about the subject itself.

Methodology – This study was done on healthy females in the age group of 20-25 years with normal BMI and in the proliferative phase of the menstrual cycle. VRT was done using the response analyser and the results of VRT were correlated with various anthropometric parameters using Pearson's correlation analysis.

Results – Visual reaction time showed a positive correlation with various anthropometric parameters (height, weight, BSA and BMI), but was not statistically significant.

Conclusion – Visual reaction time is prolonged to some extent with increasing BMI, even though the BMI is within the normal range.

Keywords – *Visual reaction time, Anthropometric variables, BMI, Females.*

INTRODUCTION

Reaction time is the elapsed time between the onset of a stimulus and an individual's response.[1] It is affected by multiple factors related to the nature of the stimulus as well as to various aspects of the subject itself. Some of the subject factors that affect the reaction time to a stimulus includes age, physical condition of the subject, practice, attitude and attention, to name a few.[2] Anthropometry is the measurement of size and proportions of the body. These measurements include individual measurements like height and weight, as well as various ratios and indices like BSA (body surface area) and BMI (body mass index).[3]

Obesity (BMI > 25.0 kg/m^2) has been shown to be associated with poorer cognitive performance resulting in longer reaction times.[4] The aim of the present study was to elucidate whether reaction time to a visual stimulus is affected by BMI within the normal range (i.e. 18.5-24.9 kg/m^2)

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MATERIALS AND METHOD

The subjects for this study were selected from normal healthy unmarried females in the age group of 20-25 years. The study was duly approved by the institutional ethical clearance committee. 50 subjects who satisfied the inclusion and exclusion criteria were selected, and informed consent was obtained from them. The exclusion criteria applied were as follows: Those taking any medication or hormonal preparations (that could alter the menstrual hormonal milieu), those having any physical illness or endocrinological disorders, smokers, alcoholics, athletes/ those involved in excessive physical activity. The subjects were instructed to visit the department during the proliferative phase i.e. 9-12th day of their menstrual cycle. Daily basal body temperature recordings formed the basis for this judgment. Height and weight were recorded

using standard methodologies. The BMI (body mass index) of each subject was calculated by dividing her body weight in kilograms by the square of her height in metres (Quetelet's index), whereas BSA (body surface area) was calculated using a standard nomograph. Response times measurements (VRT) were carried out after the subjects were thoroughly acquainted with working of "response analyzer" (YSRT – 0101 – Pune). It was ensured that no subject consumed any caffeinated products 6 h before the testing. The time displayed in milliseconds was noted and taken down as the response time for that stimulus. 10 readings were taken, the lowest readings were used for computation. The procedure room was a quiet and secluded room, whose ambient temperature was about 27°C. All tests were done between 10.00 am and 1.00 pm. The results of VRT were expressed as mean ± standard deviation and its relationship with anthropometric data were analysed using Pearson's correlation coefficient. P value < 0.05 was considered as significant. Statistical analysis was done using Microsoft Excel.

RESULTS

The average values and standard deviations of VRT and various anthropometric parameters like height, weight, BSA (body surface area) and BMI (body mass index) during the proliferative phase of menstrual cycle of the study subjects are provided in Table 1. Whereas the results of the Pearson's correlational analysis of VRT with various anthropometric parameters like height, weight, BSA (body surface area) and BMI (body mass index are represented in Table 2. VRT showed a general positive correlation with all the assessed anthropometric variables, but were statistically not significant.

Table 1: Mean values and standard deviation of Anthropometric parameters and Visual reaction time (N=50)

	Height(cms)	Weight (kgs)	BSA	BMI	VRT (msec)
Mean ± SD	161.02 ± 6.41	57.02 ± 4.99	1.60 ± 0.10	21.95 ± 0.79	185.80 ± 10.70

Table 2: Correlational analysis of Visual reaction time with various Anthropometric parameters (N=50)

	Height	Weight	BSA	BMI
R value	0.213	0.216	0.226	0.060
P value	0.136*	0.130*	0.113*	0.676*
* Not significant				

DISCUSSION

Our study demonstrates that there is a positive correlation between the various anthropometric parameters (height, weight, BSA and BMI) and visual reaction time. Hence with an increase in the value of these parameters there is a prolongation of the visual reaction time.

A study by Deore DN et al observed a prolonged VRT in the underweight as well as overweight/obese individuals as compared to normal girls and it was statistically significant.[5] In contrast to the above study which does not specify the exact timing of VRT recording i.e. phase of menstrual cycle, in our study we took the VRT readings in a specific period of the menstrual cycle i.e. the proliferative period.

Similarly a study by Simran G et al found a significantly longer VRT to yellow color in obese group as compared to control group and non-significant prolongation for red and green color.[6] Other studies have also reported similar findings as far as the relationship between VRT and BMI is concerned.[7,8,9]

It has been observed that motor as well as sensory nerve conduction velocity show a non-significant slowing with increasing BMI in several nerves in younger age group.[10]

The probable reason for this positive correlation between BMI and VRT maybe because elevations of BMI can potentially lead to pathophysiologic changes like vascular changes, impaired insulin regulation,

systemic inflammation, and reduced cardiovascular fitness which can impact cognitive functioning, thereby slowing the processing capability and leading to a longer reaction time.[4]

CONCLUSION

Visual reaction time is prolonged with increase in BMI, even within the normal range of BMI, hence factors other than accumulation of adipose tissue may also contribute to this aspect.

Conflict of Interest – None

Source of Funding- Nil

Ethical Clearance – Obtained from institutional ethical clearance committee

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A Comparative Study of QT Interval and Its Dispersion among Hypertensive and Normotensive Subjects

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ABSTRACT

Background: Hypertension is the most prevalent non communicable disease and it markedly increases both morbidity and mortality. Variation in QT intervals has been proposed as early markers of vulnerability to ventricular arrhythmias and considered as potential predictors of mortality. This study was taken up to assess early detection of changes in QT interval among hypertensive subjects and early management of cardiac abnormalities.

Aim: To assess the cardiac function status in patients with essential hypertension by analyzing QT interval, corrected QT intervals (QTc) and QT dispersion (QTd).

Method: 50 hypertensive and 50 normotensive male subjects between the age group of 40 -60 years were selected. Computerized ECG system with Nivi qure software was used for the study. Mean QT intervals, QTc and their dispersions (QTd), were assessed to observe cardiac function status. Statistical analysis was done by using paired "t" test.

Results: Mean QT intervals, QTc intervals and their dispersions were significantly higher in hypertensive subjects ($p < 0.001$).

Conclusion: The levels of both systolic and diastolic blood pressures are related to the generation of ventricular rhythm problems either via increasing left ventricular mass which results in an increase in QT parameter measurements.

Keywords: *Cardiac arrhythmias, Hypertension, QT intervals.*

INTRODUCTION

Hypertension is the most common cardiovascular disorder affecting 20% of adult population worldwide, which is also an important public health problem, both in the developed and developing countries[1]. It markedly increases both morbidity and mortality. The adverse effects of hypertension principally involve the heart, the blood vessels, the retina, and kidneys including central nervous system[2].

Hypertension is also associated with target organ damage like left ventricular hypertrophy (LVH), heart failure, coronary arterial disease, peripheral arterial disease, micro albuminuria, retinopathy and stroke. Hypertension doubles the risk of cardiovascular disease and is considered as one of the major risk factors for cardiovascular mortality, which accounts for 20- 50% of all deaths[3]. There is a significant association of cardiovascular risk with the severity of blood pressure (BP) and the level of BP control.

QT intervals are the electrocardiographic measurements of cardiac depolarization and repolarization periods. QT prolongation is associated with various components of the insulin resistance syndrome, age body mass index, left ventricular hypertrophy, persistently elevated blood pressure[4].QT interval prolongation has been associated with an increased risk of ventricular arrhythmias and sudden death in the myocardial infarction[5], in chronic heart failure[6], in diabetic patients[7] and also among general population[8]. An abnormal ventricular repolarization has also been described in patients with hypertensive heart disease[9,10] and a prolonged QT interval is a risk factor for ischemic heart disease in hypertensive subjects[11].

Increased QT dispersion have been found in patients with hypertension, diabetes, left ventricular hypertrophy, myocardial infarction, hypertrophic cardiomyopathy, chronic heart failure, mitral valve prolapse and long QT syndrome which is genetically related[12]. Left ventricular hypertrophy (LVH) and prolonged QT interval at ECG are common in arterial hypertension (AH), and are considered as major risk factors for cardiovascular disease and sudden death[13]. Studies have also shown the association of corrected QT intervals and their dispersions were significantly higher in the hypertensive group and showed direct relation with the level of systolic and diastolic blood pressures[14].

Variation in QT intervals has been proposed markers of vulnerability to ventricular arrhythmias and potential predictors of mortality. This study was taken up to assess early detection of changes in QT interval among hypertensive subjects and early management of cardiac abnormalities.

MATERIALS AND METHOD

The present study was conducted in the Department of Physiology, between June 2010 to June 2012. 50 known case of hypertensive male subjects and 50 normotensive male subjects between age group of 40-60 years were selected for the study. Smokers, alcoholics; patients with history of diabetes mellitus, congestive cardiac failure, symptomatic coronary artery disease, atrial fibrillation; subjects with secondary arterial hypertension – like pheochromocytoma, renal artery disease etc, and history of drug treatment other than antihypertensive were excluded from the study group.

All subjects were encouraged for voluntary participation after explaining the procedures to be undertaken. Informed written consent was taken from them. The subjects were advised to have their meal by 9: 00 pm, to have a good sleep at night before and to remain free from any physical or mental stress, not to take sedatives or any drugs affecting central nervous system. The subjects were also asked to avoid tea or coffee at breakfast and attend Physiology lab between 9.00 AM to 11.00 AM on the day of examination. All subjects were clinically examined and detailed history was taken with reference to duration of hypertension, family history, personal history like smoking, alcoholism etc and previous drug history. Physical examination was done. Then the subject was kept under complete bed rest in supine position for 15-20 minutes in a cool and calm environment. During this period subject was advised not to perform physical or any mental activity. Blood pressure was recorded in supine position using mercury sphygmomanometer. A standard adult size cuff measuring 23 cm by 12 cm was used for all subjects. Three readings were taken and average of second and third was used for the study.

Subjects were rested in supine position for at least 10 minutes, after which resting ECG was recorded with the subjects remaining supine for 5 minutes. ECG was acquired using digital ECG system, an instantaneous heart rate at RR intervals were continuously plotted using Niviqure software on a Microsoft window based computer. The digital ECG system was used to save multiple records and provided with additional filter settings, calculation tools, automated analysis and auto report generation facilities. QT and RR intervals were analyzed. Corrected QT (QTc) was calculated using Bazett's formula

$$QTc\ (Bazett) = \frac{QT}{\sqrt{RR}}$$

and QT dispersion was determined by taking the difference between longest (QT max) and shortest (QT min) QT interval.

STATISTICAL ANALYSIS

The results were given as Mean ± Standard Deviation and range values. Comparisons were performed using student's t-test for 2 group comparisons. The p value of 0.05 or less was considered as statistical significance.

RESULTS

Mean values and standard deviation of Electrocardiographic parameters are depicted in the table in detail. Hypertensive subjects showed statistically highly significant mean QT(ms) interval as compared to normotensive ($p<0.000$). RR(ms) interval was significantly higher in hypertensive patients ($p<0.000$). QT Max and QT min was highly significant in hypertensives ($p<0.000$). Corrected QT interval(QTc) was significant in hypertensives as compared to normal subjects ($p<0.008$). Hypertensive subjects showed significantly higher QT dispersion (QTd) as compared to normal subjects ($p<0.007$).

DISCUSSION

Hypertension is the most prevalent non communicable disorder in the world. It is a big concern because of the devastating effects of its chronic complications involving multisystem in body. Over years HRV has gained so much interest because of its non invasive and bed side procedure for early detection of cardiovascular pathology.

Over 6 decades epidemiological studies have proved increase in heart rate has increased cardiovascular morbidity in cardiovascular patients and also in general population with or without risk factors[15,16]. Our study showed elevated heart rate in hypertensive subjects. Increased heart rate is correlated with higher Blood pressure. Increased sympathetic tone manifested by higher heart rate is common among hypertensive subjects[17].

There was significant reduction in RR interval. Similar findings were reported in Pavithran et al[18]. Reduced RR interval and elevated heart rate shows decreased vagal modulation and higher sympathetic activity in hypertension patients. This study showed that QT and QTc dispersions increased in hypertensive patients had a direct relation with the occurrence of ventricular rhythm problems. QTd has been shown to be a useful noninvasive method for the detection of inhomogeneity of ventricular recovery times[19-24]. We found a relation between systolic and diastolic blood pressure levels and QT intervals, increased QT intervals and dispersions were related with increased blood pressures. The present study has shown that, even prior to the development of hypertensive heart disease there is prolongation of QT interval.

Table 1: Electrocardiographic Parameters In Study Subjects

	Hypertensive subjects		**Normotensive Subjects**		**Normotensive subjects V/S Hypertensive subjects**		
	mean	**sd**	**Mean**	**sd**	***t value***	***p value***	
QT (ms)	567.230	80.0526	460.424	47.7721	8.101	< 0.000	HS
RR(ms)	848.3914	166.81783	949.1316	140.38980	-3.267	< 0.001	HS
QTc(ms)	768.688	7.199	491.365	59.829	2.714	< 0.008	S
QT max(ms)	567.230	80.0526	460.424	47.7721	8.101	< 0.000	HS
QT min(ms)	515.98	103.869	436.98	46.821	4.903	< 0.000	HS
QTd	51.250	71.6337	23.444	4.7224	2.739	< 0.007	S

* Unpaired t-test NS – Not significant, HS- Highly significant, S- Significant

LIST OF ABBREVIATIONS USED

ANS – Autonomic nervous system

BMI – Body mass index

BP - Blood pressure

DBP – Diastolic blood pressure

ECG – Electrocardiogram

Mm Hg – millimeter of mercury

ms - milliseconds

SBP – Systolic blood pressure

QTc - Corrected QT intervals

CONCLUSION

In conclusion, testing cardiac function status is an important area of investigation in hypertensive patients, to look for ventricular arrhythmias. Since prolongation of QT interval is associated with cardiac arrhythmias, suggesting that these hypertensive patients may have risk for occurrence of cardiac arrhythmias in future. These simple noninvasive measures can be used for early detection and treatment of cardiac arrhythmias and other variations in cardiac autonomic function.

Ethical Clearance was taken from Institutional Ethical committee, JJMMC, Davangere.

Conflict of Interest – None

Source of Funding – None

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A Study on Correlation of Intraocular Pressure and Blood Pressure in Different Age Groups

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ABSTRACT

Background: Intraocular pressure of the eye is governed by the formation, presence and out flow of the aqueous humor produced by the ciliary body of the eye. Any disturbances in this mechanism will lead to Glaucoma, a second leading cause of blindness in the world. Certain systemic parameters such as hypertension, age, sex etc will influence the levels of intraocular pressure and thence may form risk factors for glaucoma. The current study was aimed at know the relation of intraocular pressure and other systemic parameters especially of blood pressure.

Materials and Method: The current prospective study carried out at Departments of Physiology and Ophthalmology, Government Medical College and General Hospital, Anantapuramu and included 150 subjects of which 75 were male and 75 were females. Standard methods were used for recording as well as analysis of data.

Results: The results of this study indicated that IOP increased with age in both sexes and it higher in women than men. The relation is statistically significant with p value <0.0001. It can also be emphasized that values of blood pressure, mean arterial pressure and Pulse pressure positively correlated with the intraocular pressure.

Conclusion: It is recommended that Intra Ocular Pressure(IOP) estimation should be made as a routine health checkup in everyone, especially in females over 40 years of age, whose systemic blood pressure, mean arterial pressure and pulse pressure values are high because of their high chances of having high intraocular pressure.

Keywords*: Age, Blood pressure, Gender, Glaucoma, Intra Ocular Pressure.*

INTRODUCTION

The aqueous humor of the eye is produced by ciliary body and drained out of the eye via trabecular complex plays an important metabolic role by providing nutrition to the avascular structures of the eye viz., cornea, lens and vitreous and thence maintains optical transparency and maintains proper intraocular pressure within the eye which is the key factor in maintaining the structural integrity of the eye globe. Normal Intra Ocular Pressure (IOP) in human beings ranges from 10-21 mm of Hg (mean 16±2.5)[1]. Under normal circumstances the Intraocular Pressure is maintained through a balance between Aqueous humor production and absorption. Various systemic body variables such as age, gender, heredity, blood pressure (B.P), posture etc., influence the intraocular pressure. This decreased physiological reserve in eye and cardiovascular system are reflected as changes in intraocular pressure and blood pressure respectively. Hypertension influences the change in Intra Ocular Pressure (I.O.P) and there by results in dysfunction of the eye leading to loss of vision.

Elevated Intraocular Pressure is one of the major risk factors for developing Glaucoma, a disease of eye that is characterized by increased intraocular pressure, field changes and optic neuropathy is a second major cause of permanent blindness in the world and accounts for 7-8 million bilaterally blind people[2].

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In the circumstances cited above, the current study is principally aimed at established relationship between the intraocular pressure and the blood pressure in different age groups with a special emphasis to find out the relationship of Intraocular Pressure with varying Blood Pressure and to determine the relationship of Intraocular Pressure with increasing age.

MATERIALS AND METHOD

The current prospective study was carried out at Departments of Physiology and Ophthalmology, Government Medical College and General Hospital, Anantapuramu, Andhra Pradesh from January'2015 to December 2015 after obtaining clearance form institutional ethics committee.

The sample size of present study is 150, which includes both females 75 (50%) and males 75 (50%) between the age groups of 31-60 years. The inclusion criteria were persons above 30 years of age, hypertensives who are not under treatment and exclusion criteria included hypertensives on treatment, persons below 30years and above 60 years of age, subjects suffering with glaucoma, subjects who are blind and people suffering from systemic diseases.

Intra ocular pressure is recorded in both eyes using Schiotz's tonometer and blood pressure was recorded using sphygmomanometer as per standard recording protocols. Intraocular pressure is estimated using Friedenwald nomogram. Blood pressure was measured and classified as per the Seventh Report of the Joint National Committee. Subsequently pulse pressure (P.P) and Mean Arterial Pressure(MAP) values were deduced from the blood pressure recordings using standard formulae.

The data obtained from the study is recorded in a pretested proforma and was analyzed using appropriate statistical methods.

OBSERVATIONS AND DISCUSSION

Intra Ocular Pressure(IOP) is an inherited[3,4] biological parameter which is inter related with other systemic parameters like age, sex, height, weight and Blood Pressure. Correlates of Intra Ocular Pressure(IOP) measurement may need to be considered in investigating determinants of it. Relationship between systemic parameters (example: Age, Sex, BP,) emphasize the physiologic interdependence of the eye with other organ systems.

Age and Intraocular pressure: It is observed from **Table No.1** that the Mean IOP in men of the age group 31-40 years was 13.3±1.7 mmHg, between 41-50 years was 14.5±1.9mmHg and 51-60 years was 16.2±2.2mmHg and in the mean IOP females (Table No.2) between age group 31-40 years was 13.5±2mmHg, 41-50 years was 14.7±1.8mmHg and 51-60 years was 16.7±2.3mmHg. Mean IOP increased with age both in males and females. In both the sexes it is clear that the mean raise of intraocular pressure is statistically significant **(p value <0.0001)** with the progression of age.

The present study is correlating with that of "The Beaver Dam Study" (1988-90) done by Klein BE & Klein R[5] and Qureshi (1997)[6]. However, the studies conducted by Carel RS[7] et.al and Mc Leod et.al[8] stated contrary to the finding.

The possible reason for increased IOP with age might be due to structural changes in trabecular mesh work and schlemm's canal which will reduce the out-flow facility of aqueous humor.

Table-1: Variation of IOP with Age in Men

Sex	Age in Years	No of subjects	Intraocular Pressure(mmHg)				F value	P value
			Mean	S. D	Minimum	Maximum		
Men	31-40	25	13.268	1.7425	11.2	17.3	13.581	< 0.0001
	41-50	25	14.544	1.9177	11.2	18.9		
	51-60	25	16.16	2.2104	11.2	18.9		

Table-2 Variation of IOP with Age in Women								
Sex	**Age in Years**	**No of subjects**	**Intraocular Pressure(mmHg)**				**F value**	**P value**
			Mean	**S. D**	**Minimum**	**Maximum**		
Women	31-40	25	13.484	1.9928	11.2	17.3	15.464	< 0.0001
	41-50	25	14.728	1.7983	12.2	18.9		
	51-60	25	16.66	2.284	12.2	20.6		

Gender and IOP: On perusal of **Table No.3**, it is evident that the mean Intraocular pressure in females (15±2.4) is higher than in males (14.7±2.3 mmHg). However, these findings are not statistically significant (p value-0.4334326). Similar findings are noted in the studies conducted by Klein BE et. al [5] and David R et.al[3]. Menopausal changes are one of the possible reasons for ocular hypertension in females as suggested by some authors [6].

Table-3 Comparison of IOP Between Male and Female					
Sex	**Number of subjects**	**Intraocular Pressure**			
		Mean	**S.D**	**Minimum**	**Maximum**
Male	75	14.6573	2.2762	11.2	18.9
Female	75	14.9573	2.3998	11.2	20.6
t value	0.7854718711				
P value	0.4334326 Not Significant				

Systolic Blood Pressure and IOP: **Table No.4** indicate that Subjects who were having systolic BP less than 120mmHg had mean IOP of13.5±1.9mmHg, between 120-139mmHg had mean IOP of 14.9±2.2mmHg and subjects between 140-160mmHg mean IOP of 16.3±2.1mmHg. An increase in mean IOP values are observed with increasing Systolic B.P. Values are statistically highly significant (p<0.0001). Leske M C, Wu Sy etal[9] and Bulpitt C. J[10] have found out similar findings in their studies.

One of the explanation provided for the strong relation between IOP and hypertension is that IOP may be thought of as a physiological equilibrium state in response to high BP, a relationship that does not exists in glaucoma and may involve a compromised vascular auto regulation mechanism resulting as a damage to the small vessels of the optic disc and mechanical strain on the optic nerve as it passes through the lamina cribrosa. The other possible mechanism is Increased ultra-filtration of aqueous fluid owing to increased perfusion at the level of ciliary body. The hypertension also decreases the out flow of aqueous humor by increasing episcleral venous pressure. Increased retinal blood volume due to raise in central venous pressure owing to increased blood pressure in the adjacently situated central retinal artery.

Table-4: Variation of IOP With Systolic BP					
Systolic Blood Pressure	**Number of Subjects**	**Intraocular Pressure(mmHg)**			
(mm hg)		**Mean**	**S.D**	**Min.**	**Max.**
<120	50	13.494	1.89159	11.2	18.9
120-139	59	14.8881	2.24323	11.2	20.6
140-160	41	16.2926	2.0537	12.2	20.6
F value	20.46821552				
P value	< 0.000001 Significant				

Diastolic Blood pressure and Intraocular Pressure: Subjects who were having diastolic blood pressure of less than 80mmHg had mean IOP of 13.7±2.1mmHg, between 80-90 had mean IOP of 15.3±2.2mmHg and 90-100 had mean IOP of 16.5±1.9mmHg. the statistical values are highly significant and were depicted in **Table No.5.** Similar results are put forwarded by Jong Soo Lee et. al[11].

Table-5: Variation of IOP with Diastolic BP

Diastolic Blood Pressure	Number of Subjects	Intraocular Pressure(mmHg)			
(mm hg)		Mean	S. D	Min.	Max.
<80	59	13.6694	2.0584	11.2	20.6
80-90	70	15.2685	2.243	11.2	20.6
91-100	21	16.4666	1.8837	13.4	18.9
F value	16.50713579				
P value	< 0.000001 Significant				

Pulse pressure and IOP: It can be inferred from **Table No. 6** that Subjects who were having pulse pressure between 31-44 had mean IOP of 13.8±2mmHg between 45-58 had mean IOP of 15.9±2.2mm Hg and 59-72 had mean IOP of 15.5±2.4mmHg. increase in intraocular pressure is directly proportional to increase in pulse pressure. These values are statistically significant.

Table-6: Variation of IOP with Pulse Pressure

Pulse Pressure (mm Hg)	Number of Subjects	Intraocular Pressure(mmHg)			
		Mean	S. D	Min.	Max.
30-44	77	13.8247	1.99803	11.2	18.9
45-58	61	15.9115	2.20817	11.2	20.6
59-72	12	15.5	2.38441	11.2	18.9
F value	17.24215757				
P value	< 0.000001 Significant				

Mean Arterial Pressure and IOP: It can be derived from **Table No.7** that Subjects who were having MAP of ≥80 mmHg had mean IOP of 13.0±1.4mmHg, between 80.1-95 mmHg had mean IOP of 13.7±1.9mmHg, between 95.1-110 mmHg had mean IOP of 15.6±2.4mmHg and MAP of>110 mmHg had mean IOP of 16.6±1.8mmHg. An increase in mean IOP. values are observed with increasing MAP. Values are highly significant.

Table-7: Variation of IOP with Mean Arterial Pressure

MAP (mm Hg)	Number of subjects	Intraocular Pressure(mmHg)			
		Mean	S. D	Min.	Max.
≥ 80.0	3	13.000	1.3856	12.2	14.6
80.1-95.0	68	13.7191	1.8865	11.2	17.3
95.1-110.0	62	15.6064	2.3502	11.2	20.6
< 110	17	16.5647	1.7905	13.4	18.9
F value	14.07919977				
P value	< 0.000001 Significant				

CONCLUSION

The results of this study indicated that IOP increased with age in both sexes and it higher in women than men. It can also be emphasized blood pressure positively correlated with the intraocular pressure. Hence, prediction of increased IOP can be anticipated depending upon simple systemic parameters like age, sex and blood pressure. Early diagnosis of increased IOP can prevent complications and in turn reduces morbidity of glaucoma.

Based on our study we recommend that IOP estimation should be made as a routine health checkup in everyone, because of the availability of effective screening tests. Measurement of IOP estimation is mandatory in individual especially in females over 40 years of age, whose systemic blood pressure values are high.

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Conflict of Interest: Nil

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VO2 Max and Body Mass in Overweight and Obese Young Adults

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ABSTRACT

Background: Low levels of cardiovascular fitness and unfavorable cardiovascular risk profiles are detected in the young population. Clinical studies have recognized a strong association between low cardio respiratory fitness and mortality. Cardio respiratory fitness can be best assessed by measuring aerobic capacity or maximal oxygen consumption. Body composition factors like fat percentage and lean body mass have close relationship with cardiorespiratory fitness. Researchers have tried correlating BMI, body fat and fat free mass with VO2 max and have reported conflicting results. Therefore, our aim was to investigate the relation between BMI, Body fat percentage and VO2Max in overweight and obese young adults.

Method: Volunteers (n=62) in the age group of 19-30 years of age with BMI ≥ 25kg/m2 were included in the study. Height, weight were measured and BMI calculated using Quetelet index, Skin fold measurements were taken and fat percent, lean body mass were derived using standard equations. VO2 max was estimated according to Bruce protocol.

Results The relation between BMI, Fat percent and lean body mass was done using Karl Pearson's correlation. There was an inverse correlation between BMI ($p<0.001$) and a positive correlation between LBM and VO2 max ($p<0.001$). Fat percent showed a negative correlation but was not statistically significant ($p=0.14$).

Conclusion: The important determinant of cardiorespiratory fitness is BMI and Lean body mass. To attain a worthy cardiorespiratory fitness level in overweight and obese individuals' any physical activity should target an increase in lean body mass and a reduction in fat percent.

Keywords: *Body mass index, Maximum oxygen consumption, obese individuals, VO2 max.*

INTRODUCTION

The global epidemic of overweight and obesity –'globesity' is emerging as a public health problem in many parts of the world[1]. Changing lifestyle and faulty food habits are adding to this epidemic of global obesity. Almost 30-65% of adult urban Indians are either overweight or obese or have abdominal obesity. [2] It is associated with an increased risk of developing various non-communicable diseases including hypertension, coronary heart disease, diabetes, stroke and some forms of cancers.. The leading cause for mortality and morbidity worldwide are cardiovascular diseases. Recently, cardiovascular ailments are increasing in the younger generation. Low levels of cardiovascular fitness and unfavorable cardiovascular risk profiles are detected in them. It has evolved as an important factor for developing cardiovascular comorbidities later in middle age. [3] Numerous clinical studies have recognized a strong association between low cardio respiratory fitness and mortality [4, 5]. Cardio respiratory fitness can be best assessed by measuring aerobic capacity or maximal oxygen consumption (VO2 max). Aerobic capacity is an integral functional capacity of all systems

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involved in supply, transportation and energetic oxygen transformation [6] Body composition factors like BMI, fat percentage and lean body mass have close relationship with cardiorespiratory fitness.

Researchers have tried correlating BMI, body fat, fat free mass and VO2 max and have found conflicting results. Therefore, we aimed at investigating the relation between BMI, Body fat percentage and VO2max in overweight and obese young adults.

METHOD

This was a cross sectional study done at Indira Gandhi medical college hospital, Puducherry, in the department of Physiology, after obtaining institute ethical committee clearance. Volunteers in the age group of 19-30 years of age with BMI ≥ 25kg/m2 were included in the study. Written informed consent were taken. Individuals with history of cardiac disease, lung disorders, smokers, on medication for chronic ailments were excluded from the study. All procedures followed were according to revised Helsinki Declaration of 2000.

Sixty two overweight/ obese individuals, staffs of our college and relatives of patients attending various out-patient departments, who volunteered for the study and satisfied the inclusion criteria, were selected. Complete clinical examination, ECG and echocardiogram were taken. The weight was taken on a weighing scale with standard minimum clothing to the nearest 0.5kg. Height was measured on a vertical scale with the heel, buttocks and occiput against the wall and the head in the Frankfurt plane to the nearest 0.5cm. Body mass index (BMI) was calculated by Quetelet Index [7], the formula BMI= (weight in kg)/ (height in mts) [2]

Measurement of body composition:

Skin fold measurements were taken from various sites including biceps, triceps, scapular, abdominal, suprailiac, thigh and medial calf sites according to standard procedures using skin fold caliper. All skinfolds were measured to the nearest 1 mm. Mean of 3 readings was recorded at all the sites. All measurements were taken by the same investigator. Durnin's age specific equations (1974) was adopted to calculate body density that was further used in Siri's equation (1961) to determine the total body fat. Fat percentage, fat mass, lean body mass [8] were derived using standardized equations [9]. Maximal oxygen consumption (VO2max) was estimated using Bruce treadmill test. It is a reliable and widely used method for estimation of VO2 max using predicted equations [10]

For Men $VO2max = 14.76 – (1.379 \times T) + (0.451 \times T^2) – (0.012 \times T^3)$

For Women VO2max = 4.38 x T - 3.9.

All data were entered and analyzed using SPSS software version 19. The relation between BMI, fat percent and fat free mass or lean body mass with maximal oxygen consumption was done using Karl Pearson's correlation. The level of significance was considered statistically significant if $p < 0.05$.

RESULTS

62 obese individuals with mean BMI 28.62 ± 2.54 in the age group of 19 - 30 years of age volunteered to participate in the study. Descriptive statistics of the study population is shown in table 1. Correlation values and significance between BMI, Fat percent, Lean Body mass and VO2max is given in table 2. Though there was an inverse correlation between fat percent and VO2 max it was not statistically significant. There was an inverse correlation between BMI and VO2 max as depicted in Fig 1 with an r value of - 0.84 ($p<0.0001$). The relation between Lean body mass and VO2 max is depicted in Fig 2 which shows a significant positive correlation with an r value of 0.9 and (p value <0.0001).

DISCUSSION

In India, the prevalence of overweight and obesity are increasing in children and young adults which are reflected in various studies [11]. Obesity is a modifiable risk factor of cardiorespiratory disease. It is therefore, important to maintain a fit cardiorespiratory profile. Cardiorespiratory fitness is a health-related component of physical fitness defined as the ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity. The single valid method to assess cardiorespiratory fitness is by estimating VO2 max.[12] Though obesity and aerobic capacity are independent prognostic markers of cardiovascular mortality, the stronger predictor appears to be aerobic capacity. Thus it is beneficial to target aerobic capacity before weight loss, although improvement in both risk factors seems to be ideal. [13]

Chatterjee et al [14] in their study assessing

cardiorespiratory fitness of obese boys compared obese with non-obese boys and reported significantly higher absolute VO2max among obese boys, reasoning it be because of higher values of body mass and LBM, which in turn exhibited significant positive correlation with VO2max (l/min) ($r = 0.82$, $P<0.001$, $r = 0.93$, $P<0.001$ respectively whereas, Researchers [15, 16] have observed a significant inverse correlation between BMI, percent body fat and VO2 max.

Huttunen et al [17] who reported that obese children were physically less fit than normal weight children as judged by pedaling time and maximum oxygen consumption related to lean body mass ($p<0.001$). Thus there is a dearth of clarity regarding the relation between VO2max and body mass. Therefore, our study assessed VO2 max in relation to body mass index and found a significant inverse correlation. This relationship gives a misleading impression that heavier persons have a relatively lower oxygen uptake and hence low aerobic capacity [18]. In fact Nevil et al [19] reported that lighter persons were more likely to be placed in a low VO2 max category. In order to have a definite result, we aimed at finding a correlation between fat percent, lean body mass with VO2 max. Our results indicate that there was a significant positive correlation with lean body mass. Fat percent had a negative correlation but was not statistically significant.

Goran et al [20] examined the influence of body weight and body composition (FM vs FFM) on aerobic fitness. The results of this study indicated that the maximal oxygen consumption of fat-free tissue is independent of body fat mass. FM does not have any effect on VO2max. , these findings suggest that obese individuals do not have lower maximal aerobic capacity of their FFM compared with lean individuals or impaired cardio-respiratory and pulmonary responses to exercise. Thus inferring, VO2 max may be normal even in individuals with higher BMI.

Since aerobic capacity is body weight dependent, the overweight and obese individuals require a greater proportion of their aerobic capacity to conduct weight-bearing physical activities. Thus, these obese individuals are more likely to find it physiologically difficult to participate in physical activities that require movement of their increased body mass. [21]

The reduction in the physical activity affects body composition factors like body fat percentage, and body muscle mass. With decrease in body fatness, there is increase in aerobic fitness. Researchers [22] have also established low VO2max in obese groups and suggested that excessive fat mass imposes unfavorable burden on cardiac function and oxygen uptake by working muscles and indicated that reduced oxygen utilization by adipose tissue during exercise reduces overall VO2max. Also in obese individuals there is increase in type II muscle fibers and decrease in type I muscle fibers which may have important effect on reduced oxygen uptake [9]

Ulf et al [23] in their study comparing oxygen uptake adjusting for body composition between obese and normal weight adolescents, reported a significant partial correlations for the VO2max and FFM relationship after controlling for FM in both groups. Hence it was considered as the important determinant of VO2 max and dividing VO2 max by FFM seemed to be an appropriate procedure when comparing groups who differ in body size. Since our results found a positive correlation between VO2 max and lean body mass it augments to the observations that lean body mass must be taken into consideration when estimating VO2 max as a measure of cardio respiratory fitness.

RESULTS

Table 1: Descriptive statistics of the study population

Variables	Mean ± SD
Age (years)	23.32 ± 6.05
BMI (Kg/m^2)	28.62 ± 2.54
Weight (Kg)	78.53 ± 9.17
Height (cm)	163.30 ± 8.32
Lean body mass (Kg)	50.879± 5.54
Fat%	34.16± 2.31
VO2 Max (ml/min/Kg)	42.80± 2.35

Table 2: Correlation between BMI, LBM, Fat% and VO2 max

Parameters	Correlation coefficient (r)	Significance (p)
BMI*	-0.84	<0.0001
Lean body mass*	0.90	<0.0001
Fat %	-0.19	0.14

*$p<0.01$ significance

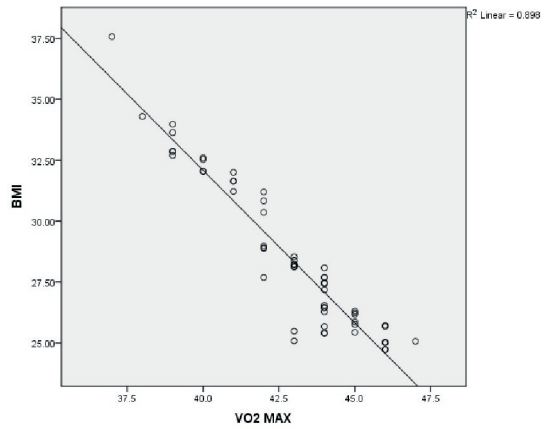

Fig 1 correlation between BMI and VO2 max

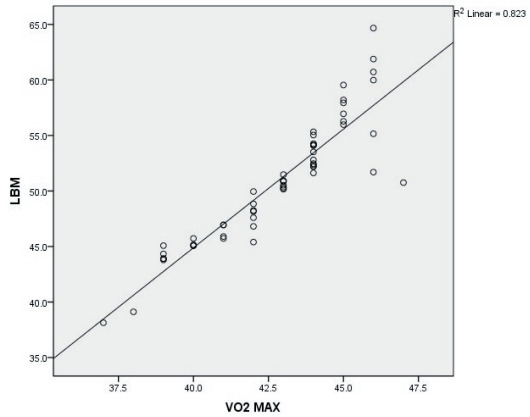

Fig 2: Correlation between Lean Body mass and VO2 max

CONCLUSION

Our results found a significant positive correlation between lean body mass and an inverse correlation between BMI ($p<0.05$), fat percent ($p = 0.14$) with VO2max. It appears that people with higher BMI have relatively low O_2uptake. It is also evident that, lean body mass has to be considered as an important determinant while estimating VO2 max. Moreover, any physical activity for improving cardiorespiratory fitness should target on improving lean body mass and a decrease in fat mass.

Institute ethical committee clearance obtained

Conflict of Interest – Nil

Source of Funding - Self

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A Study of Nerve Conduction Velocity in Newly Diagnosed Hyperthyroid Females

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ABSTRACT

Hyperthyroidism is a common endocrinological disorder due to excessive levels of T4 and T3 affecting primarily muscle function and the central nervous system. It is associated with neuropsychiatric and neurologic syndromes and myopathy. To evaluate neuromuscular dysfunction in newly diagnosed hyperthyroid patients, nerve conduction studies were done. A significant reduction in peroneal nerve motor amplitude was observed with P value of 0.05.In sural nerve sensory conduction study, the latency and conduction velocity showed significant difference from control group. The H reflex study was also done but it did not show any difference from control group. In contrast to the previous studies we found in our study that sensory motor axonalneuropathy also occurs in hyperthyroid patients. As a conclusion electrophysiological studies can be useful in the diagnosis of asymptomatic polyneuropathy in hyperthyroid patients.

Keywords: *Hyperthyroidism, Nerve conduction study, Axonal neuropathy.*

INTRODUCTION

Hyperthyroidism results from excessive levels of T4 and T3. Hyperthyroidism manifests systemically affecting primarily muscle function and the central nervous system. . Causes of hyperthyroidism includes Graves's disease, Toxic multinodular goiter, Toxic adenoma, Iodide-induced hyperthyroidism, Subacute thyroiditis. It is associated with neuropsychiatric and neurologic syndromes and myopathy. The frequency and severity of neuromuscular complications vary considerably and are probably related to the degree of hyperthyroidism. Chronic thyrotoxic myopathy is a common complication. This myopathy is characterized by progressive weakness and wasting of skeletal musculature. More than 50% of thyrotoxic patients have some degree of myopathy. The myopathy is slowly progressive; the pelvic girdle and thigh muscles are affected preferentially.

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To evaluate neuromuscular dysfunction in newly diagnosed hyperthyroid patients an electro diagnostic procedure like EMG and nerve conduction studies can be done. The nerve conduction studies play an important role in identifying the patho physiology such as axonal or demyelinating peripheral neuropathy.It provides an objective and quantitative measure of nerve function and it also helps in predicting the prognosis of neuropathy.

A nerve conduction study (**NCS**) is a test commonly used to evaluate the function, especially the ability of electrical conduction, of the motor and sensory nerves of the human body. Nerve conduction velocity (**NCV**) is a common measurement made during this test, measurements like velocity, amplitude, duration. area are also available which plays important role in making axonal type of neuropathy.NCS are used mainly for evaluation of paresthesias. The NCS consists of the following components such as Motor NCS,Sensory NCS,F-wave study, H-reflex study.

In thyrotoxic subjects motor responsiveness was significantly enhanced but sensory thresholds did not differ from control values[1]. The polyneuropathy in hyperthyroidism is probably caused by hypermetabolism in thyroid hyperfunction[2]. Electrophysiological studies can be useful in the diagnosis of asymptomatic polyneuropathy in hyperthyroid patients[3]. Although

the CNS involvement either in hypothyroidism or in hyperthyroidism have previously been shown on the basis of visual, auditory and somatosensory evoked potentials studies, less is known about the function of central motor pathways in both disorders[4]. The frequency and severity of neuromuscular complications vary considerably and are probably related to the degree of hyperthyroidism,although in some patients the neuromuscular dysfunction is caused by associated disorders rather than by hyperthyroidism per se[5].

MATERIALS AND METHOD

This study was conducted in Neurophysiology lab at Stanley medical college,Chennai. The study was approved from the Institutional Ethical committee,Stanley medical college,Twenty adult female patients with normal thyroid profile were taken as controls,16 patients of hyperthyroid patients before treatment were taken as study group who were attending Endocrinology OPD in the hospital. Patients with H/o diabetes mellitus, alcoholism, any neuro muscular disease, leprosy, drug induced neuropathy, Family H/o neuropathy, other serious illness like malignancy & HIV infection, Liver and kidney disease, pre-existence of myopathy were excluded from the study. All patients were studied after getting informed and written consent, history taking and examination were performed.

By using the standard RMS ENMG EP MARK II machine NCV recordings were done by using standard procedures. The latency, amplitude, duration, area and velocity of motor and sensory nerves were studied. The motor nerve conduction velocity (MNCV) and F wave latency of Median and Peroneal nerves and the sensory nerve conduction velocity (SNCV) of median and sural nerves were studied. All studies were done on left side but H-REFLEX was done bilaterally for all patients. The study was done with careful distance measurements, recording of well-defined artifact free responses, appropriate placement of surface electrodes and careful application of nerve stimulus.

Motor Nerve Conduction Study: Motor NCS performed by electrical stimulation of a peripheral nerve and recording from a muscle supplied by this nerve, characterized by its latency, amplitude, duration, area and conduction velocity. Latency in milliseconds(ms) is the time from the onset of stimulus to the point of take off from baseline, is an index of speed of impulse travel[6]. Size of the response called amplitude (in mV), measured from the baseline to the top of the motor response. Conduction velocity (in M/s) reflects the fastest motor axons[7].

CV (M/s) = Distance (mm) / Latency prox – Latency distal (ms)

Duration in ms signifies the onset of peak to the peak, while the area denotes the product of amplitude and duration and expressed in mVms. Both parameters reflects the density of nerve fibres conducting the impulse.

Sensory Nerve Conduction Study: SNAP(Sensory nerve action potential) is obtained by directly stimulating a sensory nerve and recording directly from it or its branches. Here too, latency, amplitude, duration, area, conduction velocity were calculated. The interpretation of Nerve conduction studies is complex. There may be generalized or focal peripheral neuropathy evident from the nerve affected and changes in latencies, amplitude and conduction velocity[7].

F-Wave Response: It evaluates the conduction velocity of nerves between the limb and spinal cord. By keeping the recording and reference electrodes in the same position, a supramaximal stimulus was given at distal point of stimulus antidromically**.** An average of 15 waves were studied. From the F wave responses displayed, F minimal latency was measured by adjusting the marker provided in the system. It is a late response long latency muscle action potential after motor response (M wave) following a mixed nerve supramaximal stimulation. 10- 20 F waves were obtained, of which shortest latency F wave are used [6].

The H-reflex (“H”OFFMAN-REFLEX STUDY): Subjects were asked to lie in prone position with leg and thigh firmly supported and feet to hang freely with dorsum at right angle to tibia. The recording electrode was placed at the distal edge of calf muscle and the reference electrode 3cms distal to it or on Achilles tendon. Ground electrode was placed between stimulus point and recording electrode. Stimulation was given at midpoint of popliteal crease where large sensory nerve fibres of Tibial nerve were stimulated. This study contains a sensory and a motor branch. The H-reflex is a monosynaptic reflex studied only with a submaximal stimulus and is abolished by supramaximal stimulation. H reflexes remain constant in response to repetitive

stimuli because it occurs from activating the same motor neuron pool. Minimum of 5 H responses were recorded and studied. On increasing the strength of the stimulus, the H response amplitude decreased, simultaneously M response amplitude increased. From the responses obtained, the latency of H REFLEX and its amplitude were obtained. This study was done bilaterally for all subjects. In contrast F-waves represent recurrent discharges from different groups of motor neurons with different conduction characteristics[8].

RESULTS

One way ANOVA F-test and multiple comparisor by Bonferroni t-test were used to compare the means between groups. P values <0.05 were considered significant. In addition, Pearsons correlation co-efficient test were used to correlate T4, TSH and BMI on motor and sensory nerve conduction studies.

1. MOTOR NERVE CONDUCTION-In this mean value of median nerve conduction velocity, peroneal nerve conduction velocity and peroneal nerve amplitude in both the control group as well as the study group were studied. A significant reduction in peroneal nerve motor amplitude was observed with P value of 0.05. The F response latency or minimal latency (F mini) of both median and peroneal nerve were 24.33 (SD 2.38) and 42.5 (SD 5.33). The results did not show significant difference from control group.

Table 1: Comparison of Motor Nerve Conduction Between Hyperthyroid And Control Females

MOTOR NERVE STUDY	CONTROL	STUDY GROUP	P-VALUE
MEDIAN NERVE (CV)	57.81(SD5.63)	58.42(SD7.03)	
PERONEAL NERVE(CV)	49.25(SD2.85)	47.37(SD5.86)	
PERONEAL NERVE AMPLITUDE	4.48(SD2.06)	2.7(SD1.85)	0.05
F-RESPONSE (F-MINI)			
MEDIAN NERVE	24.9(SD2.01)	24.33(SD2.38)	
PERONEAL NERVE	42.5(SD3.36)	42.5(SD5.33)	

2. SENSORY NERVE CONDUCTION: In sensory nerve conduction study the mean value of median nerve action potential area in control group was 22.9 (SD 20.1) whereas in hyperthyroid was 11.98 (SD 11.93) with P value < 0.02.

Table 2: Comparison of Median Nerve Action Potential Between Hyperthyroid And Control Females

MEDIAN SENSORY STUDY	CONTROL GROUP	STUDY GROUP
AREA	22.9(SD20.1)	11.98(SD11.93)
CONDUCTION VELOCITY	54.43(SD7.16)	52.25(SD8.78)

In sural nerve sensory conduction study, the latency and conduction velocity showed significant difference from control group. The mean value of sural nerve latency when compared with study group was significant with P value of 0.004. We got a significant P value of 0.001 while comparing the mean value of sural nerve conduction velocity in hyperthyroid. The amplitude and area of sural nerve action potential were also reduced in 9 out of 16 patients. The mean value of amplitude, duration and area were also observed in study group.

Table 3: Comparison of Sural Nerve Conduction Between Hyperthyroid And Control Females

SURAL NERVE STUDY	CONTROL GROUP	STUDY GROUP	P-VALUE
LATENCY	2.45(0.25)	3.46(SD1.01)	0.004
AMPLITUDE	7.725(SD3.29)	4.53(SD2.26)	0.002
DURATION	2.32(SD0.62)	3.22(SD2.5)	0.05
AREA	16.42(SD7.5)	7.89(SD4.46)	0.001
CONDUCTION VELOCITY	52.7(SD5.76)	43.45(SD8.03)	0.001

3. The H reflex study was also done but did not show much difference from control group.

4. Pearsons correlationwas done between BMI and Sural Nerve Amplitude in New hyper thyroid patients and found to be positive which is shown below in Fig1.

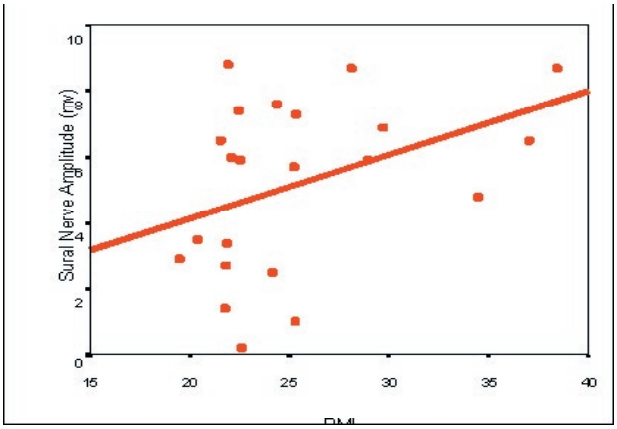

Fig1:Shows the positive correlation between BMI and Sural Nerve Amplitude in New hyper thyroid

DISCUSSION

This prospective cohort study shows that the prevalence of neuromuscular disorders in thyroid dysfunction varies between 20% to 80% as per the literature [3,9]. Our data suggests that a high prevalence of neuromuscular symptoms in thyroid dysfunction is due to a late diagnosis.The findings of motor nerve conduction studies in median and peroneal nerve were within normal range in hyperthyroid patients. But a decrease in motor nerve conduction was observed in previous studies[10,11]. A normal F response was seen in our study group.

In our study decrease in amplitude of peroneal nerve CMAP reveals myopathic changes in new hyperthyroid group. Decrease in latency, amplitude and conduction velocity of sural nerve which was observed in our study may be due to sensory axonal neuropathy. Our findings were consistent with previous studies[12].

Electrophysiogically the neuropathies in hyperthyroid groups seen are predominantly sensory. Even when motor nerve conduction velocity is still within normal range, the sensory nerve action potential may be reduced at early phase of disease. Our findings suggest the presence of initial axonal type of polyneuropathy. The polyneuropathy in hyperthyroid is probably caused by hypermetabolism in thyroid hyperfunction.

CONCLUSION

The neuromuscular signs and symptoms may occur in newly diagnosed patients with thyroid disease. Sensory motor neuropathy which commonly occurs in hypothyroid patients was also observed in our study. These neuronal changes which was observed in our study (newly diagnosed hyperthyroid) should be taken into account in clinical practice. As a conclusion electrophysiological studies can be useful in the diagnosis of asymptomatic polyneuropathy in hyperthyroid patients.

Conflict of Interest: No conflict of interest applicable for this study.

Source of Funding: Self

Ethical Clearance: The study was approved from the Institutional Ethical committee,Stanley Medical College.

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Correlation between BMI and Blood Pressure with Arterial Stiffness among Middle Aged Offspring of Diabetic Parents

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ABSTRACT

BACKGROUND: In India there is a need to reduce the cardiovascular morbidity due to diabetes in predisposed individuals as diabetes is fast gaining the status of a potential epidemic with more than 62 million diabetic individuals currently diagnosed with the disease [1,2] So we aimed to correlate BMI and systolic blood pressure with arterial stiffness among the normoglycemic offspring of type 2 diabetic parents. Noninvasive method of measuring arterial stiffness can be applied to assess the elasticity of the vessel wall and reduce the cardiovascular morbidity. **STUDY DESIGN**: Cross sectional observational study. **MATERIALS AND METHOD: SUBJECTS** n= 100 males, Age group 35-45 years. All participants had a sedentary life style, blood pressure and glycemic status were measured . Subjects with history of peripheral vascular disease, smokers and any other illness that affects arterial compliance were excluded. Arterial stiffness was assessed from Augmentation index (AI) and stiffness index (SI). AI and SI was measured using IR1 model digital finger tip photo pulse plethysmograph. **RESULTS:** Mean age = 37 ±2 years, Mean BMI = 25± 3, Mean SBP = 124± 4, Mean Stiffness index = 7.4 ±1.4 m/s, Mean Augmentation index= 48 ±2.8 %.Pearson correlation was applied BMI correlated positively with both augmentation index and stiffness index with r value is +0.215 and + 0.406 respectively. Systolic blood pressure(SBP) correlated positively with both augmentation index and stiffness index with r value is +0.391 and + 0.597 respectively. **CONCLUSION:** We conclude that increase in arterial wall stiffness was observed with increase in BMI and systolic blood pressure which might be the consequences of metabolic regulation, inflammatory pathways and other mechanisms.

Keywords*: BMI, SBP, Augmentation Index, Stiffness Index.*

INTRODUCTION

Obesity, increased blood pressure and arterial wall stiffness are independent predictors of cardiovascular diseases with high prevalence among first degree relatives[3,4]of diabetic subjects. Cardiovascular diseases are the most common cause of disability and death among subjects with non–insulin- dependent diabetes mellitus [5]. The atherosclerotic process begins during the prediabetic phase characterized by impaired glucose tolerance, hyperinsulinemia,and insulin resistance. Studies have suggested that glucose and insulin can substantially alter the structure and function of the arterial wall and affect the development of atherosclerosis [6]. These alterations are not late consequences of the disease, because recent studies have shown that arterial distensibility and wall thickness are altered also in subjects with glucose intolerance who do not have but are predisposed to diabetes [7,8] . Arterial stiffening is a natural consequence of aging, but a number of disease states have been shown to contribute to arterial stiffening, such as hypertension, chronic kidney disease (CKD), obesity, and diabetes [9]. Recording of peripheral pulse wave and digital volume pulse is a reliable index to assess stiffness index which can reflect large artery stiffness. Reflection index can assess medium and small artery stiffness [7].

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AIM

To correlate BMI and systolic blood pressure with arterial stiffness among normoglycemic middle aged offspring of diabetic parents.

STUDY DESIGN: Observational/cross sectional study.

MATERIALS AND METHOD

All participants gave a written informed consent to participate in this study. Information details about sociodemographic characteristics, disease history, family history, alcohol consumption, cigarette smoking, drug intake and occupational history were obtained by a structured questionnaire. All participants had a sedentary lifestyle. Institutional ethical committee clearance was obtained

SUBJECTS

Inclusion criteria: 100 healthy volunteers normoglycemic males with paternal or maternal history of diabetes, Age= 35- 45 yrs, Blood pressure = < 140/90 mmHg, Fasting blood sugar = 90-100 mg/dl.

Exclusion Criteria: Subjects with history of peripheral vascular disease , smokers, and any other illness that affects arterial compliance , Anthropometric measurements were taken.

Height was measured using stadiometer and weight was measured using precalibrated weighing machine. Quetlet's index was used to calculate Body mass index (weight/height in m2).Blood pressure was measured using a standard mercury sphygmomanometer. Fasting blood glucose was measured to rule out diabetic mellitus.

Recording of digital volume pulse (DVP): Digital volume pulse was recorded by in house built instrument IR1 model digital finger photoplethysmography [11]. The signal from the instrument placed on the right index finger was digitalized by digital converter with a frequency of 100 Hz which was connected to the computer. DVP was analyzed by software virtual oscilloscope.

Digital volume pulse contains 2 peaks:

1. Systolic peak.

2. Diastolic peak.

Initially Systolic peak is formed by pulse wave transmitted from the left ventricle to the finger directly.[10] Second peak or diastolic peak arises from pulse wave transmitted along the aorta to the small arteries in the lower body, from where they are again reflected along the aorta as a reflected wave[11]. This path length is proportional to the subject's height (h). Pulse transit time (PTT or ΔT) is the time interval between systolic peak and diastolic peak. It was measured by software image tool. Magnitude of systolic and diastolic peak were also measured .Stiffness index is based on the subjects height [12].

Stiffness index and Reflective index were calculated by the following formulas.

Stiffness index (SIDVP) = Subject's height (h).

Pulse transit time (ΔT).

Augmentation index (AI) = Magnitude of diastolic peak (b) × 100.

Magnitude of systolic peak (a).

RESULT

Statistical analysis was done Using SPSS Software version 16.0. The descriptive statistics of Age, BMI, Blood sugar, Systolic blood pressure, Diastolic blood pressure are mentioned in table 1.

Pearson correlation was applied. Correlation between BMI with stiffness index and augmentation index was analyzed among study group and it showed a positive correlation with r value is +.406 and +.215 respectively .Systolic blood pressure showed positive correlation with stiffness index and augmentation index with r value is +.579 and +.391 respectively (Table 2).

DISCUSSION

Our study showed a positive correlation of BMI and systolic blood pressure with stiffness index and reflective index. Indicating increased body weight and systolic blood pressure affects the vessel wall compliance in predisposed individuals.Obesity as measured by BMI[13] is the risk factors for diabetes mellitus and cardiovascular disease, such as ischemic heart disease and stroke [13,14]. Conversely, rapid weight gain with visceral fat accumulation appears to be associated with the development of arterial stiffening, although this may in part be attributable to rises in blood pressure [15]. Blood pressure plays a significant role in determining vessel wall structure, with remodeling occurring to compensate for changes in wall stress [16].Aortic pulse wave velocity (PWV) is associated with endothelial dysfunction in patients with isolated systolic hypertension, a condition

resulting from large artery stiffening [17]. The finding that the normoglycemic healthy offspring of patients with type II diabetes mellitus have decreased arterial distensibility and greater pulse pressure also suggests that arterial stiffening may occur at an early stage[18] despite apparently normal arterial structure. Arterial stiffness appears to be affected by the presence of increasing numbers of components of the metabolic syndrome[19] although the mechanisms remain unclear. Potential causes include inflammation, dyslipidemia, andoxidative stress, although these are rarely taken into accountas independent confounding factors. It is also worthwhile remembering the confounding nature of blood pressure in such studies. Non-invasive measurement of vascular wall elasticity can assess functional status of the arteries and early detection of pathologies before the onset of clinical symptoms [20,21]. Alvarez et al and Abate et al stated that after weight loss, the increased stiffness is reversed in parallel with reduction of heart rate which might be due to neural sympathetic over activity[22,23]. In addition to hypothalamic receptors, receptors for leptin have been observed on the vascular endothelium and on smooth muscle cell [24,25]. Accordingly, leptin can exert receptor-mediated influence on vessel tone and growth and, in cell culture, stimulate vascular smooth muscle proliferation and migration [26]. Peripheral Pulse Pressure, central Pulse Pressure and augmentation index, which provide additional information on wave reflection, are considered "surrogates" of arterial stiffness [27,28,29].

Table -1: Descriptive statistics:

N= 50		Mean ± SD
Age	(yrs)	37±2
BMI	(kg/m2)	25±3
Stiffness index(SI)	(m/s)	7.5 ±0.9
Augmentation index(AI)	(%)	54 ±2.8
Fasting Blood sugar	(gm/dl)	94 ±3
Systolic blood pressure	(mm Hg)	124±4
Diastolic blood pressure	(mm Hg)	82±3

Table -2: Correlation between BMI, Systolic blood pressure(SBP) with stiffness index (SI) and Augmentation index(AI).

N=50	Stiffness index (SI)	Augmentation index(AI)
BMI(kg/m2) r value	.406	.215
SBP (mm Hg) r value	.579	.391

CONCLUSION

Vessel wall compliance as measured by arterial stiffness is altered in obese and overweight individual. we assessed small and large artery function in our study. We conclude that increase in arterial wall stiffness was observed with increase in BMI and systolic blood pressure which might be the consequences of metabolic regulation, inflammatory pathways and other mechanisms.

Implicaion of Study : Our study suggest life style modification to the predisposed group like offspring of diabetic parent to improve the vessel wall compliance prevent further progression to cardiovascular diseases.

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Conflict of Interest : None

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Effect of Duration of Diabetes on Cognitive Function in Non-insulin Dependent Diabetics

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ABSTRACT

Background: The increase in diabetes among the elderly is of concern because in addition to the wide range of traditional diabetes complications, evidence has been growing that diabetes is associated with increased risk of cognitive decline.

Aims and Objectives: To find out if there is any association between cognitive function and duration of diabetes.

Materials and Method: The study was carried out in 100 individuals aged between 40-65 years consisting of 100 diagnosed cases of Non Insulin Dependent Diabetes Mellitus and 100 non-diabetics irrespective of duration of Diabetes from OPD of Mc Gann Hospital, Shivamogga. Rye's Auditory Verbal Learning Test, Verbal Fluency Test and Working Digit Span Test to assess short-term memory, Visual Reproduction Test and Validation Span Test were used to assess working memory. Statistical analysis was done using SPSS 21.

Results: Memory test scores of non insulin diabetics were significantly reduced ($p<0.001$) when compared to the memory scores of age and gender matched non-diabetics. Duration of diabetes was found to have a negative correlation with memory scores for all 5 tests: AVLT ($r=-0.849$ & $p<0.001$), VFT ($r=-0.927$, $p<0.001$), VRT ($r=-0.816$, $p<0.001$), WDST ($r=-0.829$, $p< 0.001$) and VST ($r=-0.955$, $p<0.001$).Subjects with diabetes for >10 years showed greatest cognitive decline.

Conclusion: The decreased memory status in diabetic patients may be due to many factors like hyperglycemia, hypoglycemia, vascular disease, insulin resistance, amyloid deposition and also some of the factors combine to produce additive effects like, type of diabetes, co-morbidities, age of onset, duration of the disease and type of therapy. These observed effects of duration of diabetes on memory status are of potential clinical importance because even mild cognitive impairment could interfere with day today activities.

Keywords: *Diabetes; duration; memory.*

INTRODUCTION

Memory is the complex function of the brain that uses several storage buffers of different capacity and duration. Memory function includes registration (encoding or acquisition), retention (storage or consolidation), stabilization and retrieval (decoding or recall).[1]

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Short term memory refers to the function that temporarily retains stimuli that have just been perceived and lasts for ~20 seconds. Working memory is a short term memory system that allows concurrent retention and manipulation. It is used for thinking about what are already known and deriving conclusions on the basis of that knowledge.[2]

The deleterious effects of diabetes mellitus on the retinal, renal, cardiovascular, and peripheral nervous systems are widely acknowledged. Less attention has been given to the effect of diabetes on cognitive function. Neurological consequences of diabetes appear parallel

to those observed in aging brain. The main hypothesis to explain the pathophysiology of cognitive decline associated with diabetes involves hyperglycemia, hypoglycemia, microvascular injury, insulin resistance, hyperinsulinemia, hyperphosphorylation of tau protein and amyloid-β_2 deposition.[3]

Hence, this study was done to evaluate the short term and working memory in non insulin dependent diabetics and compare it with age and gender matched non diabetics and also know the effect of duration of the diabetes on cognitive function.

MATERIALS AND METHOD

The study was carried out in 200 individuals aged between 40-65 years consisting of 100 diagnosed cases of Non Insulin Dependent Diabetes Mellitus and 100 non-diabetics from OPD of Mc Gann Hospital, Shivamogga.

Institutional Ethical Committee clearance was obtained. Details of the study protocol were explained to the subjects who volunteered for the study and Informed consent was taken General information, present complaints, history of diabetes and hypertension if present, duration and treatment of same, any past illness, drug history and family history was noted. Pulse and Blood Pressure was recorded. Laboratory investigations include Fasting Blood Sugar (FBS), Post-prandial blood sugar (PPBS) and Glycosylated Hemoglobin.

Inclusion Criteria For both the groups:

1. Age 40-65 years who have given written consent.

2. Educational status: Minimum primary school.

Exclusion Criteria for both the groups:

1. History of any known psychiatric disorders,

2. History of any other known endocrinal disorders,

3. History of any sedative/narcotic abuse,

4. History of any other known medical disorders causing dementia,

5. History of intake of any drugs known to cause dementia.

The following tests were carried out on the subjects (study & control) in a relaxed state and privacy was given utmost importance: Rye's Auditory Verbal Learning Test (AVLT), Verbal Fluency Test (VFT) and Working Digit Span Test(WDST) to assess short-term memory, Visual Reproduction Test(VRT) and Validation Span Test (VST) were used to assess working memory. [1, 4]

Statistical analysis was done using SPSS software version 21.Initially data was tested for normality using Kolmogorov-Smirnov Test and Shapirowik Test. Since the data doesn't follow normal distribution, non-parametric tests were used which include Mann Whitney U Test and Correlation Regression Analysis was done using Spearman Rank Correlation.

RESULTS

The memory scores (%) for all 5 memory tests in the non insulin dependent diabetic patients were found to be decreased and the decrease in the scores were statistically significant when compared to normal subjects (P value< 0.001) by Kruskall Wallis Anova Test.

In this study Diabetic patients were divided into 3 groups according to their duration of the disease as; Group A - Diabetes patients of ≤ 5years duration, Group B – Diabetes patients of 6-10years duration and Group C – Diabetes patients of >10years duration.

Median and IQR of all the memory test for diabetic patients of Group A, B and C are shown in Table 1. The median scores of the tests are depicted in Figure. Table No.1also shows statistical analysis by Kruskal Wallis One Way Anova Test.

1. Auditory Verbal Learning Test:

The Median memory score of the Group A diabetes patients were found to be 56%, Group B - 44% and Group C - 28.65%. The pairwise comparisons of AVLT memory score were found to be statistically significant. (P<0.001).

2. Verbal Fluency Test:

The Median memory score of the Group A diabetes patients were found to be 67.5 % when compared with scores of Group B - 48.75% and Group C - 32.5%. The pair wise comparisons of VFT memory score were found to be statistically significant. (P<0.001).

3. Visual Reproduction test:

The Median memory score of the Group A diabetes patients were found to be 94 % when compared with scores of Group B - 84% and Group C - 65%. The pair wise comparison of VRT memory score was found to be statistically significant. (P<0.001).

4. Working Digit Span Test:

The Median memory score of the Group A diabetes patients were found to be 84% when compared with scores of Group B - 54% and Group C - 34%. The pairwise comparison of WDST memory score was found to be statistically significant. (P<0.001).

5. Validation Span Test:

The Median memory score of the Group A diabetes patients were found to be 52% when compared with scores of Group B - 34% and Group C - 7%. The pairwise comparision of VST memory score was found to be statistically significant. (P<0.001).

Inter-group Significance by Kruskal Wallis One way Anova Test for the memory scores of Diabetics of different duration showed a significant p-value of <0.001 (Table No. 1) during overall comparison as well as pair wise comparison between the three groups(Group A, Group B and Group C)of Diabetic Subjects of different durations. Group C patients showed a significantly reduced score compared to Group A and Group B patients, and Group B patients showed a significantly reduced score compared to Group A patients for all the five memory tests with a significant p-value(p<0.001).

When the duration of the diabetes was correlated with the scores of memory tests using Spearman Rank Correlation, the following results were found (Table no. 2)A statistically significant correlation was found between the duration of the diabetes and scores of AVLT (r=-0.849 & p<0.001) indicating that as the duration of the disease increased the scores of AVLT deceased. VFT scores were found to be decreased with the increase of the duration of the disease which was statistically significant. (r=-0.927, p<0.001) which has negative correlation. Scores of VRT were found to be negatively correlated with the duration of the diabetes. (r=-0.816, p<0.001). WDST scores were decreased with the increase of the duration of the diabetes which was found statistically significant (r=-0.829, p< 0.001). A statistically significant negative correlation was found between the duration of the diabetes and scores of VST (r=-0.955, p<0.001).

The study revealed that an increase in duration of diabetes worsened the cognitive status (by Kruskall Wallis Anova) and also memory scores and duration were negatively correlated (by Spearman rank Correlation).

TABLE NO.1: STATISTICAL ANALYSIS

MEDIAN (MED) & INTER-QUARTILE RANGE (IQR) OF MEMORY SCORES (%), P VALUES OF KRUSKAL WALLIS ONE WAY ANOVA TEST OF MEMORY TESTS OF DIABETICS OF DIFFERENT DURATION

TESTS	DIABETIC PATIENTS						INTER GROUP SIGNIFICANCE
	Group A <5years		Group B 6-10years		Group C >10years		
	MED	IQR	MED	IQR	MED	IQR	
1. AVLT	56	5.7	44	9.7	28.65	20	OVERALL: P-VALUE<0.001 (S) PAIRWISE: C,B : p-VALUE< 0.001 (S) C, A : p-VALUE< 0.001 (S) B,A : p-VALUE< 0.001 (S)

Cont... **TABLE NO.1: STATISTICAL ANALYSIS**

2.	VFT	67.5	20.6	48.75	10	32.5	9.4	OVERALL : P-VALUE<0.001 (S) PAIRWISE: C,B : p-VALUE< 0.001 (S) C, A : p-VALUE< 0.001 (S) B,A : p-VALUE< 0.001 (S)
3.	VRT	94	9	84	8	65	34	OVERALL: P-VALUE<0.001 (S) PAIRWISE: C,B : p-VALUE< 0.001 (S) C, A : p-VALUE< 0.001 (S) B,A : p-VALUE< 0.001 (S)
4.	WDST	84	16	54	17	34	7	OVERALL : P-VALUE<0.001 (S) PAIRWISE: C,B : p-VALUE< 0.001 (S) C, A : p-VALUE< 0.001 (S) B,A : p-VALUE< 0.001 (S)
5.	VST	52	13	34	9	7	8	OVERALL: P-VALUE<0.001 (S) PAIRWISE: C,B : p-VALUE< 0.001 (S) C, A : p-VALUE< 0.001 (S) B,A : p-VALUE< 0.001 (S)

TABLE 2: STATISTICAL ANALYSIS

CORRELATION CO-EFFICIENT (r) AND P-VALUE OF MEMORY SCORES (%)OF MEMORY TESTS AND DURATION OF DIABETES IN DIABETIC PATIENTS USING SPEARMAN RANK CORRELATION

SL. NO.	TESTS	CORELATION COEFFICIENT(r)	P-VALUE
1	AVLT	-0.849	<0.001 (S)
2	VFT	-0.927	<0.001 (S)
3	VRT	-0.816	<0.001 (S)
4	WDST	-0.829	<0.001 (S)
5	VST	-0.955	<0.001 (S)

DISCUSSION

When pair wise comparison was done using Kruskal Wallis one way Anova Test among Group A (≤5yrs duration) patients, Group B (6-10yrs duration) and Group C (>10 years duration) diabetic patients for all memory tests; Group C patients showed a significantly reduced score compared to Group A and Group B patients, and Group B patients showed a significantly reduced score compared to Group A patients for all the five memory tests with a significant p-value($p<0.001$). Further, correlation regression analysis was done using Spearman Rank Correlation showed a significant negative correlation between duration of diabetes and all the five memory test scores(p-value<0.001).

In the present study it was observed that decrease in the all memory tests score were statistically significant when compared within the groups (Group :< 5yrs duration, Group B: 5-10years duration and Group C: >10years duration). This was may be because of increased duration of the diabetes[5,6-7](Mean, 7.48±3.72years), early onset of the disease[8], less years of schooling[6], poorly controlled diabetes and hyperglycemia[9] (FBS: 153.9±21.31 mg%; PPBS:237.6±38.05 mg% and HbA_{1C}: 8.15±1.05). These results are agreeable to few of the other workers like Alencar[6], Ebady[7] S.A & Weli Xu.[8]

Bhagoji SB , Patil M, Mirje M in their study entitled "Effect of Duration of Type 2 Diabetes On Short term and Working Memory " on 114 type 2 diabetics showed that short term and working memory status was negatively correlated with duration of the diabetes.[4]

Grodstein F, Chen J, Wilson R and Manson JE in their study entitled "Type2 Diabetes And cognitive Function an Community Dwelling Elderly Women" on 82 women with type 2 Diabetes, longer duration of diabetes was associated with lower scores.[10]

Korf ESC, White LR, Scheltens P, Launer LJ in their study entitled "Brain Aging In Very Old Men With Type 2 Diabetes" , on 204 non-diabetics and 202 Type 2 diabetics showed that compared with the subjects with diabetes for ≤ 5years (n=53), those with diabetes of ≥20 years(n=25) had more cognitive decline with more lacunaes , hippocampal atrophy and infarcts.[11]

Rosebud O. Roberts, Yonas E. Geda, David S. Knopman, Teresa J.H. Christianson, V. Shane Pankratz & Bradly F. Boeve et.al in their study entitled "Duration and Severity of Diabetes Are Associated with Mild Cognitive Impairment" found that Mild cognitive impairment was associated with onset of diabetes mellitus before age 65yrs (Odds Ratio, OR=2.20), diabetes mellitus duration of 10years or longer (OR=1.76), treatment with insulin (OR=2.01) & the presence of diabetes mellitus complications (OR=1.80) after adjustment for age, sex & education.[12]

Alencar RC, Cobas RA and Gomes MG in a cross sectional study entitled "Assessment of cognitive status in patients with type 2 diabetes through the mini-mental status examination" in 2007 found that 12.1% of diabetic patients in the study group with a duration of the diabetes 12.3±9.1yrs had diagnosis of dementia & this was also associated with years of study.[13]

Ebady SA, Arami MA & Shafiq MH studied 60 diabetic patients and 60 non diabetic controls & found a significant negative correlation between duration of disease and cognitive dysfunction.[7]

In the present study it was found that increase in the duration of the diabetes worsened the memory status in diabetes patients (By Kruskal Wallis Anova) and further it was also observed that all the memory tests showed memory status and duration of the diabetes were negatively correlated (Spearman Rank correlation-regression analysis) which is similar to the study by Ebady S.A.[7] This decrease in the memory was may be due to the deposition of senile plaques in the brain[14], progressive insulin resistance[15] and natural age related memory deficits[5].

LIMITATIONS

Prospective studies are required to examine the putative link between non insulin dependent diabetes and cognitive dysfunction, because only by using such study designs can a causal relationship be established. Since different studies have utilized different psychological tests, there is a need to develop a standard study design that can be employed in testing cognitive impairment in type 2 diabetes.

CONCLUSION

This study shows that the short term and working memory scores were decreased in diabetic patients and this decrease in memory status was statistically significant when compared to normal subjects. The main hypothesis to explain the decline in memory status in diabetic patients with respect to duration, gender, age, blood sugar levels and glycemic control are hyperglycemia, hypoglycemia, microvascular injury, insulin resistance, hyperinsulinemia, hyperphosphorylation of tau protein and amyloid-β_2 deposition.

The relationship is worth investigating further, because both diabetes and dementia are becoming major public health threats in view of the continuous aging of the population. A better understanding of the mechanisms linking diabetes to cognition may uncover new possibilities for prevention of age-related cognitive decline.

Ethical Clearance: Ethical clearance obtained from Institutionaal Ethical Committee.

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Conflict of Interest : Nil

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Prediction of Insulin Resistance with Anthropometric Measures in Adolescence

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ABSTRACT

In regions of higher incidence of diabetes, more frequent screening is recommended to improve diabetes management and to initiate prevention strategies. Some developed countries screen Obese children with higher BMI with oral glucose tolerance test each year. There is a need to validate use of anthropometric measures for screening and early detection of subjects who are at risk of developing diabetes. We hypothesized that normoglycemic young adult who are siblings of diabetics or obese subjects are genetically predisposed & they are known to have a higher substantial heritable component of insulin resistance than the siblings of non-diabetics. This study evaluated simple anthropometric measures that will be optimally required to predict insulin resistance in normoglycemic. Siblings of Diabetics were obese compared to siblings of non diabetics. Siblings of diabetics had higher BMI and Waist circumference with significantly lower IS values & higher IR values. It was observed that ISI_{0-120} indices showed a significantly better correlation with compared to HOMA IR in siblings of diabetics in both first & second degree relatives. ISI_{0-120} values were significantly lower in Siblings of Diabetics with higher BMI, longer Waist circumference. Significant correlation with clinical measures like BMI & waist circumference was observed. BMI <23.9 there were 50 subjects and in Group B: BMI > 24 there were 30 subjects.

Keyword: *Insulin sensitivity, Insulin resistance, IR, IS, ISI, HOMA IR, BMI, Waist Circumference*

INTRODUCTION

World Health Organization (WHO) reported the Globally the prevalence of Diabetes is increasing and is expected to double by 2030 . Type 2 diabetes (T2DM) constitutes 85-90%, it is largely attributed to notably greater longevity and being overweight or obese . There is an increase incidence in developing countries due to urbanization, lifestyle changes, less physically demanding work and the global nutrition transition. It is also observed that increasing sedentary lifestyles, marked increased intake of foods (high energy-dense but nutrient-poor)[1, 2]. Currently 62 million Indians suffer from diabetes i.e, 7.1% of the adult population. The average age on onset being 42.5 years. 1 million Indians die due to diabetes every year [3]. India is projected to be home to 109 million individuals with diabetes by 2035[4].

The Review of Guidelines for Screening and Treatment affirms the use of fasting plasma glucose test (FPG) or a 2-hour plasma glucose (2hPG) as a screening tool[5]. In regions of higher incidence of diabetes, more frequent screening is recommended to improve diabetes management and to initiate prevention strategies. Some developed countries screen Obese children with higher BMI with oral glucose tolerance test each year[6]. Insulin resistance (IR) exists when physiological normal concentration of insulin produces a less than normal biological response. Obese youth have a potential for developing metabolic syndrome, Therefore, it is critical to measure insulin resistance (IR) before the onset of IGT in order to implement preventive measure[7-17]. A simple Oral glucose tolerance test (OGTT) is the simplest and most commonly used method for evaluating IR. many mathematical models

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of IS or IR [12,13].

There is a need to validate use of anthropometric measures for screening and early detection of subjects who are at risk of developing T2DM. We hypothesized that normoglycemic young adult who are siblings of diabetics (SD) or obese subjects are genetically predisposed & they are known to have a higher substantial heritable component of insulin resistance than the siblings of non-diabetics(SND) [19,20]. We study the correlation of anthropometric measures with Insulin Resistance (IR) derived from OGTT [14-22].

The objective of this study was to evaluate anthropometric measures that can optimally predict insulin resistance (IR) in normoglycemic subjects.

MATERIAL AND METHOD

With informed consent, 80 healthy young adult volunteers were recruited for the study. The study subject's demographic and clinical data were collected. Complete clinical evaluation included weight and height measured while the subjects were fasting overnight and wore light clothes without shoes. Waist and hip circumferences (to the nearest 0.5 cm) were measured using a plastic tape meter at the umbilicus level and at the greater trochanters, respectively, and waist-to-hip ratio (WHR) was calculated. Blood pressure was measured using a standard mercury sphygmomanometer on the left arm after at least 10 min of rest, Mean BP were determined from two independent measurements.

Laboratory evaluation: A standard (75 g) OGTT was performed on all the study subjects. Blood samples for determination of plasma glucose; insulin levels were drawn at 0(fasting), 30min, 120 min after solution ingestion. Assays: Fasting (basal), 30, 120 min venous plasma glucose during OGTT was determined by glucose oxidase method on site using glucose auto analyzer. The serum plasma was stored at - 20 0C until assayed. Corresponding specific insulin concentration was determined by radioimmuno assay (RIA) using a human specific antibody RIA kit, which does not cross-react with human proinsulin. The WHO diabetes criteria for labelling the subjects as normoglycemic: a fasting venous plasma glucose concentration of less than < 6.1 mmol /l (<110mg/dl) and a 2 hour post glucose load <7.8 (<140mg/dl) was used. The data was systematically collected in the case record form designed for the study and a coded master chart prepared for data analysis. Assessment of insulin Sensitivity, the index values were calculated using physiological mathematical models like HOMA IR, QUICKI, ISI 0-120, I0 G0 Ration, and their formulas derived from OGTT. The Formulas for calculating IR/IS values are HOMA-IR = (FPI x FPG)/22.5 for IR. ISI_{0-120} = MCR / log MSI = *m* / MPG / log MSI. Insulinogenic Index = [30min insulin level – fasting insulin level (IU/ml)] / [30min plasma glucose – fasting plasma glucose (mg/dl)] [29-34].

RESULTS

In this prospective study, 79 healthy young adult volunteers were enrolled, mean age was 19.01 (18 to 25 years), Bangalore urban, Male: 33 (41.3%) and Female: 47 (58.8%). Overall clinical and laboratory characteristics of the study subjects is seen in (Table 1). 40 subjects were siblings of diabetics (SD) and 39 were siblings of non-diabetics (SND). Clinical parameters SD & SND is seen in Table 1, SD were obese compared to SND. both the groups were matched physically, clinically and by routine laboratory parameters and were found to be similar with no statistically significance.

SD are known to be more prone to develop T2DM, they had significantly higher body mass index(BMI). It was observed that SD had significantly lower insulin sensitivity indices ISI_{0-120} (56.27, $p<0.002$) and a trend towards significance was seen with QUICKI (0.29578, $p< 0.056$).

The correlation between BMI & HOMA IR is significantly higher (r=0.387, Moderate) in With SD compared to SND (r=0.144, small). The correlation between Waist circumference and HOMA_IR is significantly higher (r=0.329, moderate) in SD compared to SND (r=0.090, trivial) (Table 2). HDL decreases (to wards Abnormal) ISI 0-120 also decreases (towards Abnormal) in SD (Table 3).

It was observed that in SD, BMI and Waist circumference significantly lower IS values & higher IR values. It was observed that ISI_{0-120} indices showed a significantly better correlation with compared to HOMA IR in SD in both first & second degree relatives.

ISI_{0-120} values were significantly lower [in] subjects (SD) with higher BMI, longer Waist circumference. Significant correlation with clinical measures like BMI & waist circumference was observed Figure 1 & 2. BMI <23.9 there were 50 subjects and in Group B: BMI >

24 there were 30 subjects. The study subjects Clinical characteristics in both the healthy Groups were similar. subjects with higher BMI were significantly taller with higher waist hip ratio (Table 1). BMI in Group Ranged from 14.7 to 23.78 and Group B ranged from 24.11 to 39.48. SD had significantly higher BMI (Table 4).

DISCUSSION

It is interesting to study whether decreased IS or IR exists at a much younger age before the onset of impaired glucose tolerance (IGT) in the normoglycemic subjects. Do simple anthropometric measures correlate with IR derived from OGTT [10-15, 34].

Warram JH et al in their study on the siblings of diabetic parents found that in truly normoglycemic subjects the presence of IR was the best predictor of development of T2DM[21]. In our study siblings of diabetics had a significantly lower IS values than the sibling of non diabetics, demonstrating the feasibility of Mathematical models like ISI, QUICKI etc derived from OGTT in evaluating IR/IS in normoglycemic young adults.

Jin Ook Chung et al, observed a higher BMI was associated with higher homeostasis model assessment values for insulin resistance (HOMA-IR), as well as lower levels of insulin sensitivity index composite (ISI_{comp}). we observed similar relationsin ship between BMI , Waist circumference in our study [35].

There is substantial evidence that insulin resistance, typically defined as decreased sensitivity or responsiveness to the metabolic actions of insulin, is a precursor of the metabolic syndrome and type 2 diabetes. Alvar Loria et al, in their study to establish a cut-off point for hyperinsulinemia demonstrated that Subjects with BMI <25 Kg/m2 the subjects fasting plasma glucose < 100mg/L has a mean insulin of 13.7. It is important detect IR/IS earlier as it helps in planning preventive strategies for the subjects being evaluated and the population at large.

Table 1: Comparison of Clinical parameters in subjects with & without family history

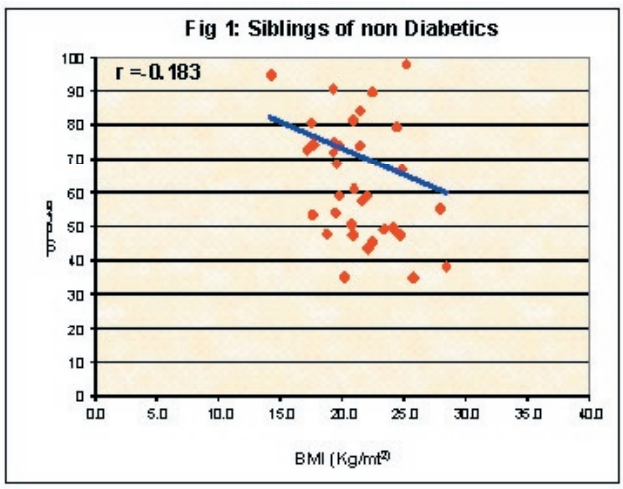
Clinical parameters	With Family history	Without family history
Height (cms)	162.06±10.13	164.79±8.47
Weight (Kg)	61.36±13.86	58.03±10.34
BMI	23.35±4.75	21.39±3.05
Waist (cms)	75.68±12.44	74.45±8.53
Hip (cms)	94.14±9.92	91.19±7.40
Waist Hip Ratio	0.79±0.068	0.81±0.067
Systolic BP (mmHg)	119.90±6.24	119.50±6.24
Diastolic BP (mmHg)	74.40±5.11	74.45±5.72

Table 2: Correlation of HOMA_IR with clinical parameters

Correlation between HOMA_ IR with	**With Family History**	Without Family History
BMI	0.387 **(p=0.014)**	0.144 (p=0.374)
W/H ratio	0.206 (p=0.203)	0.051 (p=0.725)
Waist circumference in cm	0.329 **(p=0.038)**	0.090 (p=0.581)

Table 3: Correlation of ISI_{0-120} with clinical & lab parameters

Correlation between ISI_{0-120} with	With Family History	Without Family History
BMI	-0.319 **(p=0.045)**	-0.183 (p=0.252)
W/H ratio	-0.217 (p=0.178)	-0.137 (p=0.400)
Waist circumference in cm	-0.266 **(p=0.097)**	-0.157 (p=0.335)
HDL	0.289 (0.071)	0.099 (P=0.544)



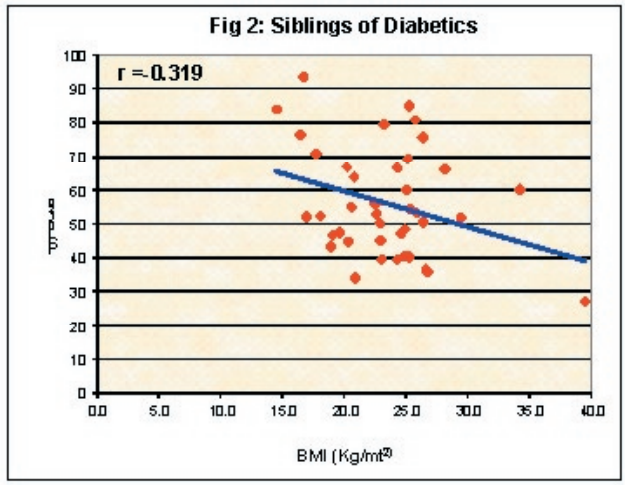


Table 4: BMI <23.9 there were 50 subjects and in Group B: BMI > 24 there were 30 subjects. The study subjects Clinical characteristics in both the healthy Groups were similar. subjects with higher BMI were significantly taller with higher waist hip ratio (Table 1). BMI in Group Ranged from 14.7 to 23.78 and Group B ranged from 24.11 to 39.48. Siblings of Diabetics had significantly higher BMI.

	Group A: BMI < 23.9	**Group B: BMI ≥24**			
	n=50		**n=30**		**P value**
	mean	**SD**	**mean**	**SD**	**Significance (2-tailed)**
Siblings of Diabetics	40% (n=20)	49%	67% (n=20)	48%	0.021
Height	163.708	9.14	162.953	9.91	0.02
Weight (Cms)	53.65	8.441	69.767	11.04	0.736
Waist (Cms)	70.12	7.48	83.317	9.994	0
Hip (Cms)	87.92	6.432	100.567	6.218	0
Waist Hip Ratio WHR	0.7965	6.36E-02	0.8267	7.14E-02	0.053
Total Cholesterol	152	27.064	165.533	23.218	0.025
Triglycerides	94.78	28.005	98.667	28.389	0.021
HDL	40.3	5.019	41.267	4.283	0.382
VLDL	18.58	4.725	19.7	5.621	0.342
LDL	93.428	28.446	104.233	22.266	0.079
hs CRP	1.03878	2.03304	2.08	2.08747	0.032
HOMA_IR	1.53756	1.10752	1.94881	1.56937	0.107
HOMA %B	181.89%	157.59	352.7	549.43%	0.042
ISI(0-120)	66.9201	22.9313	58.1182	21.5915	0.093

CONCLUSION

Simple anthropological measures like BMI, Waist Circumference correlate well with IS/IR derived from OGTT. In developing countries like India simple and cost effective parameters like Waist circumference & BMI can be used as screening tool for detection of individuals at risk of developing diabetes. Detection Insulin resistance in pre-disease condition help in initiating preventive measures for high risk individuals to prevent them to progressing to metabolic disease states.

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Correlation of Cardiovascular Efficiency with Regular Physical activity in First Year MBBS Students

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ABSTRACT

Aim- Correlation of Cardiovascular efficiency with regular Physical activity in First Year MBBS Students . **Method**- cross-sectional study was conducted on 50 MBBS students in age group of 18-24 yrs of Rama medical college and research centre. Cardiovascular fitness was measured by performing Harvard step test. **Data analysis**- The samples were analysed using SPSS-22 programme through Pearsons correlation method**. Conclusion-** any kind of moderate physical exercise improves physical fitness.

Keywords- *physical fitness index, Harvard step test.*

INTRODUCTION

Physical fitness implies not only the absence of disabling deformity or disease and the capacity to perform a sedentary task efficiently but also a sense of physical well-being and the capacity to deal with emergencies demanding unaccustomed physical effort.[1]

Over the past two decades cardiovascular fitness, i.e. the efficiency of the cardiovascular systems, has been the subject of a very large number of studies involving endurance-trained athletes. In contrast, it is only recently that the cardiovascular fitness of the general adult population has received much attention. This is due to the fact that diseases of the respiratory and cardiovascular systems have become a major cause of adult deaths in Western nations.[2]

MBBS students during the course are subjected to different kinds of stressors predominantly the pressure of academics leading to the successful completion of the educational course. Physical & mental fitness are the key to such a successful outcome. Physical fitness is used in two close meanings: general fitness-a state of health and well-being and specific fitness -a task-oriented definition based on the ability to perform specific aspects of sports or occupations. It is the result of regular exercise, proper diet and nutrition, and proper rest for physical recovery. There has been a decrease in physical activity due to a more sedentary lifestyle.

An individual is considered to be fit for a particular task or activity, when he can accomplish it with a reasonable degree of efficiency without undue fatigue and with rapid recovery from the effect of exertion. Physiological fitness implies the capacity for skillful performance and rapid recovery.[3]

MATERIALS AND METHOD

This study was conducted on 50 M.B.B.S. students in age group of 18-24 years, of Rama Medical College and Research center.The study was approved by Ethical committee of Rama Medical College and Research center. Height, weight, Body Mass Index (BMI), resting blood pressure and pulse rate were measured. Students suffering from any physical or medical abnormality and those who were unwilling to take any part in the study were excluded.

Informed consent was taken from all the students.

25 students were engaged in some kind of regular physical activity like sports, running etc. and 25 students were exercising occasionally. Resting pulse for full one minute and blood pressure was taken. Test procedure was explained beforehand. Platform of 50 cm. was used for test. As the signal begins “up, up” subject steps up with right foot , then brings the left foot up besides right foot. Then subject steps down by first bringing right foot down followed by left one, when instructed “down, down”. Rate of stepping is 30 steps per minute

for 5 minutes. Those who exhausted before completing 5 minutes were excluded from the study. Exhaustion time is taken as the point at which subject cannot maintain stepping rate for 15 seconds.[4,5,6.]

Subject immediately sits down on completion of the test and heart beats are counted for 1 to 1.5, 2 to 2.5, 3 to 3.5 minutes. Recovery index is calculated as follows.

Physical fitness index / cardiovascular fitness index =

Duration of exercise in seconds x 100 / (sum of 3 pulse counts) x2

The samples were analyzed using SPSS-22 PROGRAMME through Pearsons correlation method.

RESULTS

On statistical analysis between students who were doing occasional physical exercise (control) and regular physical exercise (cases), by SPSS 22 program through Pearson's correlation method, the mean ± SD of control was found to be 59.53 ±3.01. as compared to 72.18±6.40. among the cases. This showed a highly significant difference with the "p" value of < 0.001.

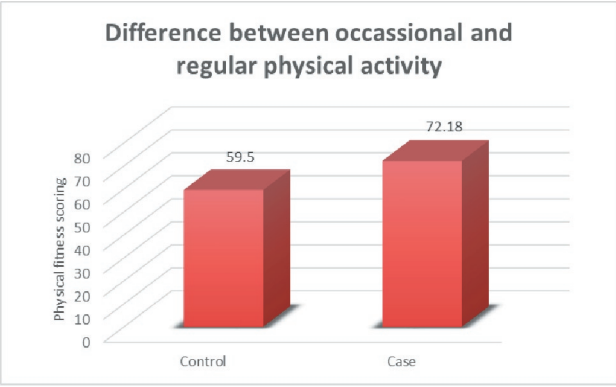

Fig 1: Difference between occasional (control) and regular (cases) physical activity

DISCUSSION

Physical fitness is normally referred to the ability of an individual to perform physical activity. To increase the longevity of the individual, the attribute of being physically fit, in order to maintain good health is exceedingly important.

In the present modern machine era which is forcing our life towards more and more sedentary style and habit of junk food has drastically reduced the good health at all ages. Therefore the incidence of obesity, cardiovascular diseases are increasing. It is predicted by the year 2025; developing countries will contribute more than half the burden of Diabetes in the world.

India will have the largest number of diabetic patients (approximately 57 million in any one country.) India would be known as the diabetic capital of the world. obesity a feature of diabetes and cardiovascular disease is a major complication that is increasingly becoming a feature of even the young population leading to morbidity and even mortality.[7]

To reduce the intensity of this alarming situation, it will be an inexpensive alternative for the population to adopt regular moderate physical activity.[8] An ideal age group will be the young individuals as this would allow greater interventions in this age group.

According to the formula applied on the subjects, students with exercise had a score of 72.186.±6.40 as mean value as compared to 59.53±3.01 the occasional exercise students. Upon applying the Pearson's correlation, p value was found to be statistically significant. p value (<0.001).

This can be explained by the fact that regular physical activity improves muscle strength and boosts endurance. Exercise delivers oxygen and nutrients to tissues, helps cardiovascular system work more efficiently. When the heart and lungs improve, we have more energy to tackle daily chores.

Boosts high density lipoproteins (HDL), or good cholesterol and decreases unhealthy triglycerides. This keeps blood flowing smoothly, which decreases the risk of cardiovascular diseases.

Heart rate increases with physical activity to supply more oxygenated blood to your muscle. The fitter you are the more efficiently your heart can do this, allowing you to work out longer and harder. As a side effect, this increased efficiency will also reduce your resting heart rate. Your blood pressure will also decrease as a result of new blood vessels forming.

When you work out regularly, your brain gets used to this frequent surge of blood and adapts by turning certain genes on or off. Many of these changes boost brain cells function and protect from diseases such as Alzheimer's, Parkinson's or even stroke, and ward off age related decline.

A number of neurotransmitters are also triggered as endorphins, serotonin, dopamine, glutamate, and GABA. Some of these are well known for their role in mood control. Exercise in fact is one of the most effective prevention and treatment strategies for depression.[9]

So this study proves that physical activity is an important determinant and predictor of physical fitness.

CONCLUSION

Students with regular physical activity have better fitness index; so we should motivate our students to involve in some regular physical activity which will improve their academic performance also.

Conflict of Interest- Nil

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Anisocytosis in Hyperglycemic Patients - Why is it Important?

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ABSTRACT

Background: Incidence and prevalence of diabetes is increasing all over the world . Increased blood glucose level is an important risk factor in the development of diabetic microvascular and macrovascular complications. Hyperglycemia induces biochemical and haematological changes. Erythrocyte deformability improves blood flow in microvessels. Both persistent and variable hyperglycemia causes various changes in the RBC membrane and its cytoplasm. This leads to modification in the deformability of RBC membrane. With prolonged exposure of RBCs to hyperglycemic conditions, the deformability of RBCs is further decreased, and its aggregation increases. This makes whole blood more viscous and responsible for microvascular complications. This decreased deformability is reflected as anisocytosis in peripheral smear. This study is aimed at finding the correlation between hyperglycemia and anisocytosis and educating the diabetic population about the importance of maintaining the blood glucose levels under control.

Method: This study was done in 150 subjects in the age group 25 to 50 years (50 control (25 male and 25 female)with normal fasting blood glucose level 70 -110 mg/dl, 50 subjects (25 male and 25 female) having blood glucose level between 126-200 mg/dl and 50 subjects (25 male and 25 female) having blood glucose levels between 200-300 mg/dl of Annapoorana Medical college hospitals. Patients with anaemia, malnutrition, and other chronic diseases whose RBCs may show anisocytosis were excluded. Fasting blood glucose level was measured. Peripheral smear was prepared and stained with Leishman's stain. Smear was focused under oil immersion objective, and the image was captured using a digital camera. Image was transferred to the computer system and RBC diameter was measured using UTHSCA image tool software. Variation in size of the RBCs between control and subjects was compared using Pearson's product moment correlation coefficient and Paired sample t test.

Results: Graded increase in the variation in the size of RBCs (anisocytosis) was observed with graded increase in blood glucose levels. By using Pearsons product moment correlation coefficient ,significant r value of 0.5,0.8 and 0.95 were got in male control group, mild hyperglycemic(125-200 mg/dl) group and moderate hyperglycemic (200-300 mg/dl) group and r value of 0.4, 0.7 and 0.76 were got in female control, moderate hyperglycemic and severe hyperglycemic group. Comparing blood glucose and anisocytosis using Paired sample t test, significant p value of < 0.01 was got in male and female mild hyperglycemic and moderate hyperglycemic group.

Conclusions: Erythrocytes of diabetes mellitus patients are floating in hyperglycemic environment during their life span. Hyperglycemia induces the production of ROS(Reactive Oxygen Species) causing oxidative stress as well as lipid peroxidation which may accelerate vascular complications in diabetes. This induces the changes in erythrocyte deformability and causes the aggregation of RBCs, in turn, affects their flow properties in the blood vessels. This accelerate the vascular complication in diabetics.

Keywords: *Hyperglycemia, Red Blood Cell membrane deformability, Oxidative stress, Peripheral smear, Image tool, Anisocytosis.*

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INTRODUCTION

The incidence and prevalence of Diabetes Mellitus is increasing in the world, due to sedentary life style and improper food habits. Type II diabetes mellitus has reached epidemic levels not only in developed nations

but also in developing nations. Since the requirement for physical effort in home and at work place is also reduced, there is continuous increase in the rate of over weight , obesity and type II diabetes mellitus. More than 50% children of this generation are spending most of their time with televisison and playing video games in laptop with packets of junk food and carbonated drinks near them. This leads to development of type II diabetes mellitus at an earlier age. DM is a metabolic disorder caused by defective insulin production or inappropriate utilization of insulin by the cells resulting in abnormal carbohydrate metabolism which causes hyperglycemia (high blood glucose levels).Hyperglycemia is a major factor in development of diabetic complications. This hyperglycemia causes changes in the RBC membrane. Importantly hyperglycemic environment decreases the deformability of RBCs. Erythrocyte deformability improves blood flow in microvessels. Both persistent and variable hyperglycemia causes various changes in the RBC membrane and its cytoplasm. This leads to modification in the deformability of RBC membrane. [1] With prolonged exposure of RBCs to hyperglycemic conditions, the deformability of RBCs is further decreased, and its aggregation increases. This makes whole blood more viscous and responsible for microvascular complications. [2] Diabetes is the most common cause of polyneuropathy and responsible for non traumatic amputations, nephropathy, and retinopathy. [1] There are only few studies about the changes occurring in RBC membrane in hyperglycemia. In this study we aimed at finding the impact of hyperglycemia on anisocytosis. By making the diabetic population to visualize the anisocytosis in their own peripheral smear we can educate them and prevent the diabetic complications more effectively.

METHOD

This study was conducted in 150 subjects between the age group 25 -50 years who attended the Annapoorana Medical College Hospital. This study was started after getting ethical clearance from the ethical committee of Annapoorana Medical College and Hospitals. 50 (25 male and 25 female) subjects with normal fasting blood glucose levels(70-10 mg/dl) were included in the control group. 50 (25 male and 25 female) subjects with mild hyperglycemia (125-200 mg/dl) and 50 (25 male and 25 female) subjects with moderate hyperglemia (200-300 mg/dl) were included in the test group. Written consent was got from all the subjects who participated in the study. Ideal peripheral smears were prepared and stained with Leishman's staining. Smear was focused under oil immersion objective, and the image was captured using a camera. Image was transferred to the computer system and RBC diameter was measured using UTHSCA image tool software. The calibration image was taken from the Neubauer's counting chamber smallest square of RBC which is 50 micron. Magnification factor was kept constant for all the images. We compared the the variation in the size of erythrocytes between the control with normal blood glucose levels, and subjects with increased blood glucose levels. Since the details of morphology of RBCs cannot be obtained by automated analysers, manual method of measuring anisocytosis was preferred in this study. Best diagnostic support was given by Systematic examination of blood film and all the other test were either complimenting or confirming it.[3] Computer based image analysis method to determine red cell size, provides an accurate and reliable measurement, which is simple and cost effective. [4] The diameter of 25 RBCs were measured from each image. The variation in the size of RBCs (anisocytosis) (largest diameter_ smallest diameter) , between the control and hyperglycemic subjects were compared.

RESULTS

We used Pearson's product moment correlation coefficient and Paired sample t test to find the correlation between hyperglycemia and anisocytosis. If the r value is near 1, there is significant correlation, if r value is positive there is positive correlation and if the r value is negative there is negative correlation. There is graded increase in variation in the size of RBCs (anisocytosis) in mild and moderate hyperglycemic subjects. Hyperglycemia was positively and significantly correlated with anisocytosis. The r values got after comparing the hyperglycemia and anisocytosis in male control and male mild and moderate hyperglycemic subjects were 0.5, 0.8 and 0.95 respectively. For female control and mild and moderate hyperglycemic subjects the r values got were 0.4 and 0.7 and 0.76 respectively. (Table 1)

The normal variation in the rbc size is 1-2 microns. But, in mild and moderate hyperglycemic subjects , the variation in the RBC size (anisocytosis) is 2.5 and 3.7 microns respectively which gives the significant r values (Table2). By comparing the anisocytosis with hyperglycemia using Paired sample t-test ,

the significant p value of < 0.05 was got in male and female hyperglycemic subjects. (Table 3) (Figure1 and Figure2).

DISCUSSION

From our study, we come to know that, hyperglycemia is positively and significantly correlated with anisocytosis. Diabetes mellitus (DM) is a group of metabolic disorder characterized by abnormal carbohydrate metabolism resulting chronic hyperglycemia (high blood glucose levels) caused by defective insulin production or appropriate and efficient utilization of insulin by cells. Severe complications are caused due to inappropriately managed diabetes. These chronic, long term complications are related to blood vessel diseases. Blood vessel diseases are generally classified into micro vascular disease (small vessel disease) such as retinopathy, nephropathy and neuropathy) and Macro vascular disease concerning the heart and blood vessels (large vessel disease)[5]. Hyperglycemic induced variation in hematological parameters has been reported by several studies. Elevation in glucose concentration is one of the major factor that effects the erythrocyte morphology i.e., the severity in the change of erythrocyte shape depend upon the plasma glucose level. This in turn, affects their flow properties through alteration and deformation at individual level and aggregation at collective level.[6] The functional properties of erythrocytes are changed due to addition of altered biochemical and tissue products in the blood .[7]

Hyperglycemic state glycosylates hemoglobin, creates oxidative stress inside the RBC and puts the cellular components at risk.[8] Oxidative stress also causes, conformation changes in membrane cytoskeleton protein which alters fluidity of the membrane, erythrocyte shape, size and osmotic fragility.[9] Erythrocytes stay in hyperglycemic environment during their life span are exposed to oxidative stress, which is confirmed by the presence of (MDA) –MalonDiAldehyde(indicator of lipid peroxidation) and decreased glutathione in the RBCs, which provokes the changes in erythrocyte deformability and the aggregation. Peroxidation of the cell membrane lipids changes the membrane permeability. [10]

Lipid peroxidation causes polymerization of membrane components and decreases cell deformability[11]. In general, the overall effect of lipid peroxidation is to decrease membrane fluidity. [12] It has been shown that peroxidation of erythrocyte membranes causes formation of high-molecular-mass protein aggregates within the membrane. [13] The impairment of erythrocyte deformability is attributed to the alterations in the membrane structure. These changes may include: Altered concentration ratio of cholesterol / phospholipid in the membrane core, amplified membrane lipid peroxidation. [14] Alteration in lipid –protein interactions, along with increased glycosilation derived internal viscosity leads to altered viscoelastioc properties of erythrocyte membrane which leads to decreased deformability of RBCs in diabetes. [15]

Membrane proteins spectrin and actin in sub membraneous cytoskeletal meshwork are responsible for viscoelastic properties of RBC membrane.[16] There is structural deteriotion of erythrocyte membrane in diabetes. [17] In hyperglycemic environment beta spectrin is most glycosilated, and spectrin is oxidatively damaged, leading to decreased deformability. [18] Regarding enzyme and ionic balance, in RBCs exposed to hyperglycemic environment, there is alteration in Na+ K+ ATP ase (decreased) which plays a central role in regulation of intracytoplasmic homeostasis.[19] Hyperglycemia induces the production of ROS causing oxidative stress as well as lipid peroxidation which may accelerate vascular complication in diabetics. [2] Oxidative stress, also result in endothelial dysfunction[20].

The red blood cell (RBC), is a non-nucleated cell. So it exhibits a very limited biosynthesis capacity and poor repair mechanisms. So they are vulnerable to physical and/or chemical stress. Oxidative stress, causes oxidative damage to the lipids and proteins in the RBC membrane. The erythrocyte is a good model to study the oxidative damage of lipids and proteins occurring in pro inflammatory and oxidative conditions. [21] Higher oxidative stress leads to reduced erythrocyte survival and results in anisocytosis due to an increase in the proportion of circulating premature erythrocytes. [22] So we compared blood glucose levels and anisocytosis in this study.

TABLE :- 1. Correlation between hyperglycemia with anisocytosis using Pearson's product moment correlation coefficient.

Variable	Male control r value	Male mild hyperglycemic subject r value	Male moderate hyperglycemic subject	Female control r value	Female mild hyperglycemic subject r value	Female moderate hyperglycemic subject.
Blood sugar	0.5	0.8*	0.95*	0.4	0.7*	0.76*

Positively Significant r values were got between hyperglycemia and anisocytosis in mild hyperglycemic group and moderate hyperglycemic group.

Table 2 : Variation in RBC size between control and hyperglycemic subjects.

Study subjects.	Range of RBC size (microns)
Male controls (n= 25)	6.2 to 7.9
Male mild hyperglycemic subjects (n= 25)	5.8 t0 8.5
Male moderate hyperglycemic subjects (n= 25)	5.8 to 10.2
Female controls (n= 25)	6.1 to 7.8
Female mild hyperglycemic subjects (n= 25)	5.8 to 8.3
Female moderate hyperglycemic subjects (n= 25)	5.7 to 9.1.

Table:-3. Correlation ofhyperglycemia with anisocytosis using Paired sample t Test.

		CONTROL	Mild hyperglycemia	Moderate hyperglycemia						
		Mean	Std. Deviation	Sig. (2-tailed) -(p value)	Mean	Std. Deviation	Sig. (2-tailed) -(p value)	Mean	Std. Deviation	Sig. (2-tailed) -(p value)
MALE	ANI	1.6	.23		2.5	.30		3.6	.52	
	B.Sugar	92	19	0.008	149	18	.000**	244	29	.000**
FEMALE	ANI	1.6	.2		2.4	.2		3.3	.15	
	B.Sugar	98	12.2	.065	146	12.6	.000**	222	24	.000**

* significant at P < 0.01In the present study , we observed significant correlation, P value (< 0.01) increased blood sugar and Anisocytosis in mild and moderate hyperglycemic group.

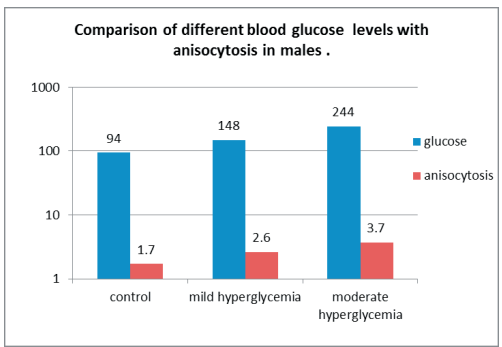

Figure :- 1. Comparison of different blood glucose levels with anisocytosis in males .

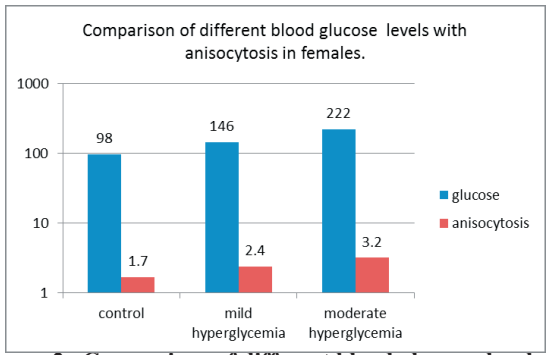

Figure :- 2. Comparison of different blood glucose levels with anisocytosis in females.

CONCLUSIONS

The disease burden of diabetes is increasing day by day. The microvascular and macrovascular complications of diabetic patients are also increasing. In our study we found positive correlation between hyperglycemia and anisocytosis. Glycosylated hemoglobin stimulates oxidative stress, which increases the reactive oxygen species, which increases the rigidity of the RBC membrane and decreases the deformability of RBC membrane leading to anisocytosis. This decrease in erythrocyte membrane fluidity in hyperglycemic patients reduces the rate of blood flow (in particular in the microcirculation) and the oxygen diffusion through the erythrocyte membrane and its exchange with tissues, which causes the further complications. Good glycemic control (either by diet or oral hypoglycemic drugs) could be supportive and beneficial in reducing harmful effects in diabetics. So it is high time we have to sensitise and educate the diabetic population in an effective manner. With this computer based image analysis method , we can make the patients to visualize the anisocytosis in their RBC. we can explain them if anisocytosis is present in their blood, they are prone for vascular complications, and diabetic patients will keep their blood glucose levels under control and prevent themselves from vascular complications of diabetes.

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Conflict of Interest: None declared.

Ethical approval: This study was approved by Instituitional Ethics Committee.

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Study of Effect of Visual Stimuli on Heart Rate Varibilityin Young Adult Males

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ABSTRACT

The effects of visual stimuli on cardiac autonomic activity using Heart Rate Variability (HRV)was studied in 50 healthyadult males. Beat tobeat R-R intervals were cotinuously recorded under closed eye condition (CEC) and the open eye condition(OEC). HRV frequency domain parameters like LF nu, HF nu, LF/HF were obtained with the helpof RMS polyrite – D version 3.0.11.There was a significant ($p<0.05$) decrease in HF nu in OEC when compared to CEC, and a significant($p<0.05$)increase in LF nu and LF-HF ratio in OEC when compared to CEC. Indicating increased sympathetic activity and reduced parasympathetic activity in OEC[1].

Keywords: *Autonomic activity, Heart Rate Variability, visual stimuli.*

INTRODUCTION

Physiological responses to environmental stimuli have been investigated intensly[2,3]. Heart rate at rest is regulated through the activity of cardiac autonomic nervous system. The stimulation in the sympathetic nervous system increases heart rate and excitation of parasympathetic nervous system reduces heart rate by increasing vagal tone. Heart Rate Variability (HRV) is a specific and sensitive non-invasive tool to evaluate cardiac autonomic activity. HRV is the degree of variation of the heart rate under the balanced influence of sympathetic and parasympathetic components of the cardiac autonomic nervous system. HRV also indicates the extent of neuronal damage to autonomic nervous system. Human beings are very sensitive to light exposure, and changes of light intensity can shift many physiological parameters like melatonin, alertness, body temperature, heart rate (HR), and heart rate variability (HRV)[4,5]. This study is an effort to assess the effect of visual stimuli on cardiac autonomic activity using Heart Rate Variability in young adult males as sudden cardiac death in later ages can be prevented if life style modifications are brought in earlier.

MATERIALS AND METHOD

Parameters

Study was designed and carried out in the Department of Physiology of Subbaiah Institute of Medical Sciences. Fifty subjects, who were young adult males (18-21 years) from general population were considered for the study. They were subjected to two sets of five minute digital ECG recording at 9 a.m. following light breakfast without tea or coffee.

Ethical clearance was obtained from our institution ethical committee and informed consent was obtained from all the subjects.

Inclusion criteria:

Healthy50 healthymalesof adolescent age group of 18-21 years were included in the study.

Exclusion criteria:

Subjects who are obese or with history of diabetes mellitus, hypertension, respiratory illness, cardiacdiseases and endocrinal disorders were excluded. Subjects on any medications were also excluded.

Measurement of Heart Rate Variability parameters:

Subjects were made to listen to constant low volume white noise to remove the bias of sound on HRV.

Basic anthropometric measurements were done like weight , height without footware.

Instruments used:

RMS polyrite – D version 3.0.11.

Subjects were explained in detail about the ongoing procedure, ECG was digitally recorded after 10 minutes rest using lead II. 5 minutes ECG in supine position was recorded, with subject breathing normally and used to determine the LFnu, HFnu and LF/HF.

Two such recordings were obtained.One while the subjects kept their eye closed initially, and thenwith eyes opened .The heart rate variability between open and closed eye state were compared.

Fast Fourier Transformation spectrum - FFT was done using Welch's periodogram method and Hanning window analysis of RMS polyrite – D version 3.0.11 to calculate HFnuLFnu and LF/HF.

STATISTICAL METHOD

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. Analysis of variance (ANOVA) has been used to find the significance of study parameters between three or more groups of patients, Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups Inter group analysis). Effect size has been computed to find the effect of obesity on HRV parameters. Student 't' test (two tailed; independent) has been used to test the homogeneity samples based on of age (or continuous parameters).

FINDINGS

The values ofLFnu, HFnu and LF/HF for all the subjects under both the closed -eye condition (CEC) and open- eye condition(OEC) were obtained. .Values of LFnu and LF/HF under CECappear to be smaller than those OEC .The mean value of HFnu for under CEC was significantly greater (< 0.05 level) when compared to OEC.

DISCUSSION

Light plays a central role in life. Without sunlight there is no life on earth. Effects of light stimulation and light therapy on autonomic functions (e.g., body temperature, HR, or HRV) were already investigated in several human studies[9,10,11]. Changes in automaticity of the pacemaker caused by increased activity of pacemaker caused by increased activity of parasympathetic nerves are rapid due to quick activation of special acetylcholine –regulated K^+ channels in the cardiac cells and decay of the cardiac response is quick due to rapid hydrolyzation of acetyl choline.the cardiac response to increased sympathetic nervous activity is much slower than the response increased parasympathetic activity due to a delayed release of noradrenaline and to media tion via a slow second messenger system. Thus changes in the activity of parasympathetic nervous system can alter heart rate much more rapidly exerting beat –by –beat control of heart rate compared to sympathetic nervous system[6]. LF-HF ratio is sensitive measure of sympathovagal balance[7] .Increase in LF-HF ratio indicates increased sympathetic activity and decrease in ratio incicates increased parasympathetic activity[1]. HFnu is an index of parasympathetic activity.In one of the studies participants who were exposed to red light (versus a control color) exhibited a decrease in HF-HRV, and this result was associated with worse cognitive performance[8].

Table 1: Basic characteristics of subjects

Variables	Subjects
Age in years	20.14±1.32
BMI (kg/m^2)	23.06±0.31

Table 2: Comparision of FFT spectrum between CEC and OEC

HRV	CEC	OEC	P value
LF nu	30.624±2.68	35.949±3.049	<0.05*
	(25.609-41.817)	(30.609-46.817)	
HF nu	69.375±4.085	64.05±3.04	<0.05*
	(58.183-74.391)	(53.183-69.391)	
LF/HF	0.446±0.06	0.568±0.08	<0.05*
	(0.344-0.718)	(0.441-0.88)	

Values Mean ± SD

(Range of data)

* Highly significant

LIMITATIONS OF THE STUDY

The present study is focused only at the effect of visual stimuli on the cardiac autonomic frequency domain parameters. The study is limited to one geographical area and confined to one gender of a specific age group.

SCOPE FOR FURTHER STUDY

Present study can be expanded in comparing the effect of auditory stimulus on the cardiac autonomic frequency domain and time domain parameters in a various environmental and geographical conditions, in other gender, also in different age groups and during meditation and yoga which involves closure of eye for obtaining more clarity on the relation of these stimuli on heart rate variability.

SUMMARY AND CONCLUSION

The parasympathetic component of the cardiac autonomic activity increased during the closed eye condition when compared to the open eye condition. It signifies that closing eyes for a while might help heart by increasing the parasympathetic component of the cardiac autonomic activity.

Conflict of Interest: Nill

Ethical Clearance: Ethical clearance was obtained from the institutional ethical clearance committee.

Funding: Self

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Progressive Muscle Relaxation Training Blunts Cardiovascular Autonomic Excitatory Response in Offspring of Hypertensive Parents

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ABSTRACT

The objective of the study was to study the effect of progressive muscle relaxation on cardiovascular autonomic functions in offspring of hypertensive parents. A total of 40 normotensive offspring of hypertensives, who were participants of relaxation training programme at Bengaluru, were divided into study group and control group with 20 subjects in each group by randomization. Initially, the HR, HRV and BP response to mental stress were measured in all the subjects. Then the study group underwent twelve weeks of progressive muscle relaxation training whereas the control group did not. At the end of twelve weeks, second recording session was held and the same parameters were reassessed in all the subjects. Twelve weeks of relaxation training had caused significant decline in heart rate reactivity, reactivity values of total power, LF power, reactivity as well as recovery of diastolic pressure. The study concluded that twelve weeks of progressive muscle relaxation training significantly reduced the cardiovascular autonomic excitatory response to mental stress in offspring of hypertensive parents.

Keywords: *Progressive muscle relaxation, cardiovascular autonomic response, mental stressor, Offspring of hypertensives.*

INTRODUCTION

Evolutionary pressures over millions of years have adapted the sympathetic nervous system as a major mediator of the fight or flight response. When sympathetic system is used in emergency settings, it improves the individual's chance of survival and increases the likelihood that his genes will be passed on to the next generation. Increase in the frequency of activation of sympathetic system would exact a toll on the integrity of the functioning of cardiovascular system, more often leading to adverse cardiovascular events.

The role of mental stress, in the development of hypertension, is likely to depend on an interaction of at least three factors: the nature of the stressor, its perception by the individual, and the individual's physiological susceptibility[1]. People may become hypertensive not just because they are more stressed but because they respond differently to the stress[2,3]. Studies have shown that the heightened reactivity, lack of adaptation, and delayed recovery occur in the sympathetic system of normotensive subjects at genetic risk of hypertension, in response to repeated mental stress. These recovery impairments may be among the earliest precursors to the development of essential hypertension in this population[4]. Since the environment of the subject causing the stress could hardly be changed, an attempt was made to change the perception of the events and hence the reaction of the subject to the particular stimulus. Progressive muscular relaxation training is such an effort. Edmund Jacobson found that an individual trained in voluntary relaxation was able to achieve a neuromuscular tonus while awake that is lower than that of light sleep, and that this tonus was representative not merely of the muscles but of the nervous system as a whole [5,6].

The physical and mental relaxation, as achieved through practice, has reproducible physiological effects

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such as increase in skin resistance, reduction in respiratory rate, heart rate, blood pressure, oxygen consumption, arterial lactate levels and sympathetic activity and this is termed as relaxation response[7]. The relaxation response activates areas in the brain responsible for emotion, attention, motivation, and memory (e.g., anterior cingulate, hippocampal formation, amygdala) and the anxiolytic effects may occur by promotion of an inhibitory (GABAergic) tone in specific areas of the brain[8]. Studies have shown that practice of progressive muscle relaxation for three months had significantly reduced Perceived Stress Scale levels[9]. We hypothesized that twelve weeks of progressive muscle relaxation training significantly reduces the cardiovascular excitatory autonomic response to mental stress in normotensive male offspring of hypertensive parents.

MATERIALS AND METHOD

Ethical clearance was obtained from ethical committee of Bangalore Medical College, Bengaluru. A total of 40 subjects in the age group of 18 to 30 years, were recruited from a premiere relaxation training centre situated in Bengaluru. The pre set questionnaire was given to the subjects and based on the reply, they were recruited for the study. The following criteria were stipulated for selection of subjects.

Inclusion criteria:

Healthy male subjects in the age group of 18 – 30 years with systolic blood pressure <140mmHg and diastolic blood pressure <90mmHg were included in the study[10]. Their parents should have been diagnosed as having essential hypertension, before the age of 60 years, from a physician.

Exclusion criteria:

Those who had practiced yoga/meditation earlier, highly trained athletes, those who are on chronic medication that affects heart rate or blood pressure, chronic nicotine or alcohol use and those with diabetes mellitus, obesity and other chronic systemic diseases were excluded from the study.

The subjects (n=40) were allocated into study (n=20) and control group (n=20) by simple randomization method using random number table. Purpose and the nature of the proposed study were explained to the subjects and written consent was obtained from each of them. Detailed medical and personal history was taken. Thorough physical examination was conducted. Parental history of hypertension was confirmed by verification of the prescription from the physician.

Experimental Protocol

The tests were carried out in the training centre between 5.00 pm and 7.00 pm. The standards of task force of European society of cardiology were followed during the recording procedure[11]. The ECG was recorded at rest in the sitting position along with quiet respiratory movements for each subject for the period of 5 minutes using RMS polyrite D hardware 2.5 equipment. The blood pressure was measured at the end of 5 minutes using mercury sphygmomanometer.

After 5 minutes of baseline recording, the serial subtraction mental arithmetic task was applied to the subjects for the next 5 minutes, while the ECG was recorded continuously. The mental serial subtraction task has been shown to cause sharp increases in cardiovascular parameters[12]. The current study used a serial subtraction task adopted from Cacioppo et al[13]. No consideration was given to participant's math ability. Participants were instructed to respond in pace with a metronome set at 40 beats per minute. When participants did not respond in the allotted time, they were told to keep pace with the metronome. When an incorrect response was given, participants were told wrong and were given their last correct number and to continue subtracting from the correct number. The blood pressure was recorded at the end of 5 minutes. After 5 minutes of mental arithmetic task, the subjects were told that the task was over and to relax. The ECG was recorded continuously for another 5 minutes and the blood pressure was recorded at the end of 5 minutes.

After the initial recording session, the study group attended progressive muscle relaxation training programme. The programme consisted of oriental classes explaining the scientific basis and benefits of practicing relaxation techniques, followed by training sessions for the period of twelve weeks. During the training period, the subjects were taught progressive muscular relaxation by the experts in training centre, for the period of 30 minutes per day, 5 days in a week for twelve weeks. They were asked to impart these practices in their daily activities since the goal of relaxation technique is to diminish the distinction between formal relaxation

practice and everyday life. The Controls were told about benefits of mental relaxation and they were asked follow their own way of relaxing methods like reading books, listening music for 30 minutes daily for 3 months.

After the period of twelve weeks, both study group and control group underwent final recording session. The procedures were same as that of initial recording session consisting of baseline recording of BP, HR, and HRV at rest in the sitting position, recording during mental arithmetic task and during recovery from mental arithmetic task.

Statistical analysis of data

Frequency domain analysis of RR interval was done by HRV analysis V 1.1 software (biomedical signal analysis group, Finland). Data was expressed as mean ± SD. Students paired 't' test and repeated measures analysis of variance were used to compare the means before and after relaxation training. Friedman test was used to find significance in repeated measurements of non-normal distributions within each group. Chi square test and Fischer's exact test were used to analyze parameters on categorical scale. For all comparisons, $P<0.05$ was considered statistically significant[14].

RESULTS

There was no statistically significant differences seen in age (p=0.852) and BMI (p=0.929) between study and control group. The laboratory mental stressor raised all the parameters significantly (p<0.001) from their baseline values in both study and control groups except HFnu. HFnu decreased significantly during mental stress (p<0.001). Following twelve weeks of relaxation training, the heart rate response during mental stress decreased significantly (p<0.001). The Total Power in the power spectral analysis of HRV decreased significantly during mental stress (p=0.003). LF power decreased in the study group (p=0.043). No significant difference was observed with HF, LFnu, HFnu and LF/HF. The baseline systolic blood pressure was not significantly reduced after relaxation training while the reactivity and recovery values decreased significantly in the study group (p=0.001 and 0.005 respectively) as well as control group (p=0.017 and 0.011 respectively).The reactivity and recovery values of diastolic pressure also decreased significantly (p=0.001) following relaxation training. No significant change was observed in control group.

Table no 1: Comparison of Heart rate, Heart rate variability and Blood pressure values between pre and post study period in both study and control groups (Expressed as Mean ± SD).

Parameter		Study group		Control group		Training effect	
		Pre	Post	Pre	Post	Study	Control
Mean HR (beats /min)	A	75.1±3.5	74.3±3.3	72.1±4.1	71.3±4	0.213	0.110
	B	82.4±3.9	76.4±3	79.6±3.9	78.7±3.5	<0.001	0.772
	C	76.30±5	74.1±3.2	72.9±4.5	71.8±4	0.187	0.569
TP (ms^2)	A	904.7±289.1	886.3±191.4	924.7±180.9	812.5±238.3	0.365	0.679
	B	1652.5±494.3	1306.5±333.7	1455.1±440.2	1565±387.8	0.003	0.104
	C	941.9±218.2	779.7±225.5	937.7±275.8	845.1±199.4	0.204	0.763
HF (ms^2)	A	177.6±54.9	131.3±33.8	161.9±49.2	140.7±35.1	0.584	0.611
	B	216.4±73.4	167.6±41.8	223.6±69	245.7±63.9	0.909	0.239
	C	178.9±77.6	124.9±34.9	166.3±64.2	153.8±43	0.697	0.481
LF (ms^2)	A	492.5±153.7	512.6±149	497.5±150.3	426.5±180	0.273	0.123
	B	945.6±398.8	802.2±262.2	823.6±347.7	959.2±218.3	0.043	0.079
	C	479±193.6	417.3±107.7	473.7±140.9	444.3±123.4	0.241	0.459

Cont... **Table no 1: Comparison of Heart rate, Heart rate variability and Blood pressure values between pre and post study period in both study and control groups (Expressed as Mean ± SD).**

HFnu	A	28.3±9.8	20.9±4.4	25.2±8.1	26.4±7.6	0.146	0.678
	B	19.1±5	17.9±4.2	22.3±6.8	20.6±5.1	0.223	0.664
	C	28.3±7	23.3±5.8	26.1±7.5	26.4±6	0.506	0.705
LFnu	A	71.7±9.8	79.1±4.4	74.8±8.1	73.6±7.6	0.146	0.678
	B	80.9±5	82.1±4.2	77.7±6.8	79.4±5.1	0.223	0.664
	C	71.7±7	76.7±5.8	73.9±7.5	73.6±6	0.506	0.705
LF/HF	A	2.9±1.2	4±1	3.2±1	3.1±1.3	0.341	0.638
	B	4.7±1.9	4.8±1.1	3.9±1.4	4.1±1.2	0.172	0.236
	C	2.7±0.8	3.5±1	3.2±1.3	3±0.9	0.531	0.888
SBP (mmHg)	A	115.1±6.9	113.2±4.7	114.3±6.1	114.4±5.8	0.565	0.155
	B	121.2±7.7	116.4±4.6	120.1±7.4	118±4.9	0.001	0.017
	C	120.5±7.7	115.5±5.1	120.7±7.1	116.9±5.2	0.005	0.011
DBP (mmHg)	A	76.2±5.3	74.4±3.8	77.6±5.7	75.4±4.3	0.267	0.126
	B	79.9±5.6	75.9±4.5	80.2±5.5	79.7±4.6	<0.001	0.591
	C	80.2±5.3	75.4±4.5	79.4±5.3	78.4±4.7	<0.001	0.255

HR, heart rate;SBP, systolic blood pressure; TP, total power; DBP, diastolic blood pressure; HF, high frequency power; HFnu, high frequency power in normalized units; LF nu, low frequency power in normalized units;A, baseline values; B, reactivity to mental stressor; C, recovery from mental stressor;

DISCUSSION

Effect of laboratory mental stressor on HR, HRV and BP

The mean heart rate is significantly increased during mental stress in both groups. This is attributed to increased sympathetic drive coupled with parasympathetic withdrawal that occur during stress. Total power is increased significantly during stress in both groups. Total power in the power spectral analysis of HRV is indicative of overall HRV. High HRV is a sign of good adaptation to the stressor. High variability in offspring of hypertensive parents shows that they adapt to the given stress by bringing about necessary modulation in the autonomic nervous system[15]. Autonomic modulation of cardiovascular system in normotensive people with hypertensive family members and that of hypertensives is a continuum. Studies have shown that the hypertensives have low TP in response to mental stress. The transition occurs over a period of time, from high HRV to low HRV that is, from high to low autonomic modulation favoring the hypertensive state. LF power increased significantly during stress in both groups. Increase in LF is a sufficiently reliable index of increased sympathetic activity[16]. LFnu is increased during mental stress showing increased sympathetic activity. HF power indicates vagal modulation at SA node. In the present study, HF is increased during mental stress. Levy MN studied peripheral interactions of sympathetic and parasympathetic systems in the heart and also found that the sympathetic nerve activity could excite parasympathetic fibres thus increasing the vagal activity. He termed this as reciprocal excitation[17]. This could explain increase in HF during stress, observed in the present study. HFnu is decreased during stress in both groups, indicating the dominant sympathetic activity during the stressful situation. LF/HF is an indicator of sympathovagal balance. Increase in this ratio during stress shows that the balance is shifted towards sympathetic activity. Systolic and diastolic blood pressure increased significantly during stress in both groups. Widgren BR et al speculated that such increased systolic and diastolic blood pressure responses to stress seen in offsprings of hypertensives could be related to subsequent development of high blood pressure in future[18]

Effect of progressive muscle relaxation on cardiovascular autonomic response

The total power decreased significantly after relaxation training reflecting preservation of high autonomic reserve in the study group. The decrease in LF seen in the present study is concurrent with the observation made by Lucini et al which indicates that the sympathetic activity is decreased after relaxation training[15]. No significant changes could be observed with LFnu, HF, HFnu, HF/LF values. Probably, the duration of training might not be sufficient enough to cause significant changes in these values. The heart rate reactivity reduced significantly following relaxation training. The baseline systolic blood pressure is not significantly reduced after relaxation training while the reactivity and recovery values decreased significantly. Even in control group, significant decrease in systolic pressure could be noted during follow up recording. This could be due to familiarization of the subject with the environment. Schneider GM et al found that impairment of recovery of diastolic pressure might be among the earliest precursors to the development of essential hypertension in such population[4]. In the present study, we found that the relaxation training has significantly reduced the diastolic blood pressure during recovery from mental stress test. These findings indicate that the relaxation training significantly reduced the cardiovascular autonomic excitatory responses to mental stress.

CONCLUSION

The present study has shown that the progressive muscle relaxation training significantly reduced heart rate reactivity, TP and LF power in HRV analysis, reactivity and recovery values of diastolic blood pressure, in response to mental stress. All these observations indicate that cardiovascular autonomic excitatory response is significantly reduced in offspring of hypertensive parents. This reduction in excitation of autonomic nervous system might offset the development of hypertension in offspring of hypertensive parents. Long term studies are warranted to prove this benefit.

"Mental calmness is the natural result of physical relaxation" – Edmund Jacobson.

Conflicts of Interest - None

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A Prospective Study on Haematological and Biochemical Profiles in Alcoholic Liver Disease Patients Attending KIMS Hospital Out Patient Department (OPD) Hubballi

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ABSTRACT

Background:- Alcoholic Liver Disease(ALD) is one of the leading social problem arising in the young individuals of India.It has a negative impact on both the physical,mental and economic aspects of individuals' life.

Objectives:- To study the Haematological and Biochemical profiles in 30 ALD patients and 30 controls attending KIMS Hospital, Hubballi.

Materials and Method:- The present study was undertaken in ALD patients attending KIMS Hospital Medicine OPD No. 40,Hubballi.

Statistical Analysis was done.

Results:- The mean Hb, RBC count, Platelet count, PCV, MCHC, Total Protein and Albumin were significantly decreased while the mean MCV, TLC, Absolute neutrophil and lymphocyte count, Total and Direct Bilirubin, Liver enzymes and Derritis ratio were significantly increased in ALD patients ('P' value < 0.05). There were no significant changes in Lipid profile and Renal Function Test parameters.There were no significant differences ('P' > 0.05) in the parameters in relation to the duration they taking alcohol.

There was a highly significant correlation between duration of the cases' alcohol intake and their CAGE questionnaire score ('P' value < 0.01).

Conclusion:-ALD is one of the leading causes of deaths,more prevalent in the males.ALD damages the liver parenchyma and deranges the blood parameters.

Keywords:- *alcoholic liver disease;haematological parameters;total protein and albumin;total and direct biliru bin;aminotransferases;derritis ratio;alkaline phosphatase;CAGE questionnaire.*

INTRODUCTION

Alcohol consumption is well entrenched in the social fabric of many adult populations, virtually constituting a behavioural norm.Sustained excessive alcohol consumption is a brain-centred addictive behavioural disorder that crosses all boundaries of gender,race,age, economic strata and in many patients,might lead to alcoholic liver disease (ALD).[1,2,3]

The major health risk of alcoholism includes liver disease,heart disease,pancreatitis, central nervous system disorders and certain forms of cancer.[4]

Liver function tests (LFTs) are a group of clinical laboratory tests performed to get information about the state of patient's liver.[5]The assay of liver enzymes indicates the intactness of liver and analysis of liver metabolites indicates the normal functionality of liver. A biochemical clue is the ratio of AST to ALT (2:1 at least), reflecting the low level of activity of ALT in people with alcoholic liver disease.[6] The liver plays a crucial role in the synthesis, secretion, catabolism, and storage of lipids and lipoproteins.Therefore, the serum lipids and lipoproteins concentrations in liver diseases could be changed.[7-10]Generally, the level of plasma lipids and lipoproteins tends to decrease with the severity of liver disease.[11,12] The Haematological tests namely,RBC counts,WBC counts,Haemoglobin levels and MCV are strong indicators of ALD as reported by several researchers.[13]

The aim of our present study is to individually study the haematolgical and biochemical profiles of all patients with ALD and to find out changes in the parameters in relation to the duration of their alcohol intake and the correlation between the duration of alcohol intake with their CAGE scoring.

MATERIALS AND METHOD

The present study was undertaken in 30 ALD patients. Ethical approval was taken.

i. Inclusion Criteria :-

• Male patients,Age > 20 years,History of alcohol intake for more than five years duration

iv. Exclusion Criteria :-

• Female patients,Age < 20 years,History of alcohol intake since less than five years duration,Known case of Diabetes Mellitus, Hypertension, Cirrhosis or non alcoholic liver disease (NALD) ,Asthma, Epilepsy or any other chronic diseases

The Statistical analysis was done between cases and controls using **Unpaired Students` t-test**.The analysis between the groups was done using **ANOVA**. Lastly, the correlation between the duration of alcohol intake and CAGE score was found using **Pearsons` coefficient**.

FINDINGS

The following study is conducted with 30 cases(Group 0) and 30 controls(Group 1).

ANALYSIS OF PARAMETERS BETWEEN CASES AND CONTROLS (GROUP 0 AND GROUP 1 RESPECTIVELY)

Table 1 :- The mean, S.D. and 'P' value for Hb levels, RBC counts, PCV, MCV,MCH and MCHC :-

Variable	Group 0 (n = 30) Mean±S.D.	Group 1 (n = 30) Mean±S.D.	'P' value	Significance
Hb(g / dL)	8.23±2.712	13.13± 1.167	0.000	VHS
RBC count(millions / µL blood)	3.03 ± 0.850	5.37 ± 0.669	0.000	VHS
PCV(%)	27.23 ± 6.436	44.17 ± 2.653	0.000	VHS
MCV(fl)	107.17 ± 6.131	84.57 ± 2.459	0.000	VHS
MCH(pg)	29.47 ± 4.257	27.77 ± 2.459	0.063	NS
MCHC(%)	30.33 ± 2.682	32.37 ± 0.964	0.000	VHS

Table 2:- The mean, S.D. and 'P' value for Absolute Leukocyte Count (Equal variances not assumed are used for 'P' value) :-

Variable	Group 0 (n = 30) Mean±S.D.	Group 1 (n = 30) Mean±S.D.	'P' value	Significance
Neutrophils (cells/ µL blood)	7461.23 ± 1510.591	4679.00 ± 1218.169	0.000	VHS
Lymphocytes (cells/ µL blood)	3697.63 ± 1338.624	1718.83 ± 419.185	.000	VHS

Table 3 :- The mean, S.D. and 'P' value for Total protein, Albumin and Bilirubin (Total and Direct) :-

Variable	Group 0 (n = 30) Mean±S.D.	Group 1 (n = 30) Mean±S.D.	'P' value	Significance
Total Protein (g / dL)	6.30 ± 1.291	6.83 ± 0.648	0.048	S
Albumin (g / dL)	2.67 ± 0.844	4.43 ± 0.504	0.000	VHS
Total Bilirubin (mg / dL)	6.63 ± 8.168	0.63 ± 0.4900	0.000	VHS
Direct Bilirubin (mg / dL)	3 ± 4.495	0.3367 ± 0.0718	0.001	HS

Table 4 :- The mean, S.D. and 'P' value for Liver Enzymes :-

Variable	Group 0 (n = 30) Mean±S.D.	Group 1 (n = 30) Mean±S.D.	'P' value	Significance
AST (U /L)	145.80 ± 17.515	26.70 ± 5.497	0.000	VHS
ALT (U / L)	54.50 ± 8.476	23.83 ± 4.035	0.000	VHS
Derritis ratio (AST : ALT)	2.7294 ± 0.4864	1.1333 ± 0.3457	0.000	VHS
ALP (U / L)	120.93 ± 47.914	58.53 ± 16.423	0.000	VHS

Table 5 :- The mean, S.D. and 'P' value for Lipid Profile :-Nothing Significant

Variable	Group 0 (n = 30) Mean±S.D.	Group 1 (n = 30) Mean±S.D.	'P' value
Total Cholesterol (mg / dL)	148 ± 14.692	150.63 ± 16.992	0.523
Triglycerides (mg / dL)	154.60 ± 20.767	148.90 ± 21.728	0.303
HDL (mg / dL)	27.43 ± 5.494	27.83 ± 5.318	0.775
LDL (mg / dL)	77.63 ± 12.686	78.27 ± 9.120	0.825

Table 6:-The mean, S.D. and 'P' value for Renal Function tests:-Nothing Significant

Variable	Group 0 (n = 30) Mean±S.D.	Group 1 (n = 30) Mean±S.D.	'P' value
RBS (mg / dL)	85.90 ± 23.453	80.13 ± 5.888	0.197
Urea (mg / dL)	23.50 ± 20.577	25.97 ± 4.687	0.525
Creatinine (mg / dL)	1±0.455	1 ± 0.000	1.000

The 30 cases are divided into three groups (Group A, B and C) on the basis of the number of years they have been taking alcohol.The Mean and Standard Deviation (S.D.) are calculated for all the parameters in all groups.

NONE OF THE PARAMETERS SHOWED ANY STATISTICAL SIGNIFICANCE WITH RESPECT TO THE DURATION OF THEIR ALCOHOL INTAKE

CORRELATION BETWEEN THE HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS AND DURATION OF THE ALCOHOL INTAKE USING ANOVA

CORRELATION BETWEEN DURATION OF ALCOHOL INTAKE AND CAGE QUESTIONNAIRE SCORE

Table 7 :- Cross Tables

	Group A	Group B	Group C	Total
CAGE Score 1	5	0	0	5
CAGE Score 2	4	0	0	4
CAGE Score 3	1	5	3	9
CAGE Score 4	4	2	6	12
Total	**14**	**7**	**9**	**30**

CONCLUSION

During one year study period from 01- 01- 2014 to 31- 12- 2014 , 30 cases and 30 controls were studied and various parameters were analyzed. Also the cases were divided into three groups and the parameters were analyzed between the formed groups. Also the correlation was found between duration of alcohol intake and the CAGE Questionnaire Score of the cases.

A. **Haematological Parameters :-**

1) Haemoglobin and RBC count :-

In the present study the mean Hb value of cases and controls was 8.23 g / dL and 13.13 g / dL respectively. The difference between the groups was very highly significant. ('P' value < 0.001).

The mean RBC count in the present study was 3.03 million cells / µL blood for cases while for control the value was 5.37 million cells / µL blood , the difference being very highly significant. ('P' value < 0.001).

Similar observations were made by Neelesh Deshpande et al.,[14] in a study where they concluded depleted Hb and RBC counts between controls and compensated cases. However , a study by Luis Costa Matos et al.,[15] showed no significant difference between cases and controls. There was no significant difference found in Haemoglobin percentage by a study done by Shivam Khare et al.[16]

PCV and Blood Indices (MCV, MCH and MCHC) :-

The mean PCV values were 27.23 % and 44.17 % for cases and controls respectively with a very high significant difference ('P' value < 0.001). The MCV values` difference was also very highly significant and was increased in cases (107.17 fl), a condition called MACROCYTOSIS with 'P' value < 0.001. The MCH values were not significant while the MCHC values also showed a very highly significantly difference being decreased in cases (30.33 %), a condition called HYPOCHROMICITY with 'P' value < 0.001.

The observations were concurrent with the findings of the study done by Adolf Pfeffrebaum, M.D. et al.,[17] who found significant difference in PCV values of cases and controls ('P' value < 0.05).

TLC, Platelet count and Absolute Leukocyte Count :-

The present study showed leukocytosis in cases with TLC count being 11382.30 cells / µL blood. Also there was thrombocytopenia in cases with platelet count 77151.83 cells / µL blood. The cases showed increased absolute count of neutrophils and lymphocyte. All the differences were statistically very highly significant wit 'P' value < 0.001. TLC was also elevated in a study by Aswad Al.Obeidy[18] concluded leukocytosis is a frequent and important abnormality in alcoholic hepatitis. In a study by Oke Oluesegun Taiwo et al.,[19] the platelet count was significantly decreased in cases. Weed and Reed [20] commented that alcohol inhibits platelet production from the bone marrow and thus reduce their number.

The possible explanation for above parameters is the fact that alcohol has a variety of pathologic effects to the bone marrow resulting in vacuolization of the marrow precursor cells causing anemia , leukemia and thrombocytopenia. The MCV is frequently elevated in alcoholics which may be due to the fact that vitamin B_{12} and folate are poorly absorbed and / or utilized in alcoholism during erythropoiesis and hence results in defects in RBC maturation with subsequent increase in the size of RBC (macrocytosis).[21] Also , the ALD patients are very susceptible for acute and acute on chronic infection and thus absolute counts of neutrophils and lymphocytes are increased.

B. Biochemical Parameters :-

1) **Liver Function Tests :- (Protein and Bilirubin) :-**

The present study showed hypoproteinemia and hypoalbuminemia amongst cases with a mean total protein value of 6.3 g / dL and total albumin value of 2.67 g /dL. There was hyperbilirubinemia in cases and the mean total bilirubin was 6.63 mg / dL and direct bilirubin was 3 mg / dL. The differences were statistically significant with 'P' value < 0.05 for total protein ; 'P' value < 0.001 for albumin and total bilirubin and 'P' value < 0.01 for direct bilirubin. The abnormalities can be explained with regards to defects in synthesizing , uptake and excretory function of liver.

Similar observations were made by M Adak et al.,[22] where the differences were statistically significant ('P' value < 0.001 for total protein, total and direct bilirubin

and 'P' value < 0.01 for albumin).

Liver Enzymes and Derritis Ratio :-

The presnt study showed mean values of AST, ALT and ALP as 60.07 U/L, 56.37 U/L and 120.93 U/L respectively for cases and the difference was very highly significant with 'P' value < 0.001. The Derritis ratio (AST : ALT) ratio was 2.72 for cases and the 'P' value was < 0.001.

In a study by Prasad P. Torkadi et al.,[23] similar observations for found with regards to the three enzymes. In a study by Manisha Arora et al.,[24] the AST , ALT and their ratio showed similar findings with 'P' value < 0.001. The elevation in ALT was not as high as AST. They concluded that this reflected the diminished hepatic activity of these enzymes which made them to leak into the serum from the damaged hepatocytes.[25]

There were no studies in regards to negative correlation with the above findings.

Lipid profile:- The present study showed no significant changes in the Lipid profile parameters ('P' value > 0.05) and they were within normal limits in both cases and controls.The probability might be the lesser duration of alcohol intake of five years considered here which might not have resulted in damaging liver cells extensively so that there could be derangement in the lipid profile.

In the present study there was no significant correlation between changes in lipid profile parameters and duration of their alcohol intake and no studies found in supporting it.

4) Renal Function Tests (RFT) :-

The present study showed no significant changes in the Renal Function Test (RFT) parameters ('P' value > 0.05) and they were within normal limits in both cases and controls.

The present study showed no significant correlation between changes in RFT parameters and duration of the alcohol intake of the cases and no studies were found for the same.

C. Correlation between Duration of Alcohol Intake and the CAGE questionnaire score :-

In the present study, the 30 cases were divided on the basis of the duration of their alcohol intake and their CAGE questionnaire score and the cross tables drawn. On applying Chi – Square analysis, it was found that the 'r' value was 0.556 and there exists a highly significant correlation between the two parameters ('P' value < 0.01).

Conflict of Interest :- Nil

Source of Funding :- Self

Ethical Clearance :- Taken

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Effect of Body Mass Index on Audiovisual Reaction Time in Healthy Young Males

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ABSTRACT

Background: Reaction time is the time taken by an individual to react to a stimulus. It is an indirect index of processing capabilities of the Central Nervous System and is affected by various factors.

Aims & Objective: The present study was conducted to assess the effect of Body Mass Index on Auditory and Visual reaction time in healthy young males (17 - 25 yrs.) with the help of Audiovisual reaction time by standard machine.

Method:- 120 healthy young male subjects were randomly selected.Subjects were divided into 3 groups according to their body mass index:-

Group 1:- Normal (BMI 18.5 – 24.99 kg/m^2)

Group 2:- Underweight (BMI < 18.5 kg/m^2)

Group 3:- Overweight (BMI > 25 kg/m^2)

Results:- Auditory Reaction Time (ART) and Visual Reaction Time (VRT) assessed by using one – way ANOVA with post – hoc Tukey's HSD test. Both Auditory Reaction Time and Visual Reaction Time were prolonged and highly significant ($p<0.0001$) in group 2 and group 3 in comparison to group 1.

Conclusion:-Overweight & obesity both play a significant role in ones Audiovisual reaction time.

Keywords:*- Auditory Reaction Time, Body Mass Index, Visual Reaction Time.*

INTRODUCTION

In the present day scenario humans have developed fast response to stimuli due to excessive use of video games ,mobiles screen.

Audiovisual reaction time is the speed, with which a person can respond to an auditory stimulus and visual stimulus respectively[8]. It provides an indirect index of the processing capability of the central nervous system and also a simple means of determining sensory – motor performance[4].It determines the alertness of a person because how quickly a person responds to a stimulus depends on his reaction time.

Reaction time has physiological significance and is a simple and non invasive test for peripheral as well as central neural structures. Reaction time becomes crucial for survival during driving, adventurous sports,etc. and is an important quality of a sportsperson. Reaction time measurement includes the latency in sensory neural code traversing peripheral and central pathways, perceptive and cognitive processing, a motor signal traversing both central and peripheral neuronal structures and finally the latency in the end effector activation (i.e. muscle activation). So any change in reaction time indicates presence of a peripheral and/or central disturbance.

Reaction time is affected by number of factors such as Age, Gender, Exercise, Left v/s Right Hand,

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Fatigue etc. Studies have shown that Body Mass Index (BMI) calculated as Weight (Kg) divided by square of Height (m^2) influences cognitive functions, attention and memory[3] Therefore present study was designed to find out whether BMI affects auditory and visual reaction time.

MATERIAL AND METHOD

The present study was conducted in the Department of Physiology, MG Medical College& Hospital, Jaipur after getting approval from institutional ethical committee. For the study, 120 normal, healthy males (17 – 25 yrs.) were taken and categorized into 3 groups according to their Body Mass Index (BMI). 40 subjects were taken in each group.

BMI is calculated by Weight (Kg) / Height (m^2). Height was measured with subject standing barefoot, feet together, eyes looking straight ahead and back in contact with measuring bar of stadiometer. Body weight recorded by a digital weight scale barefoot and with light clothes. Then the subjects were divided into 3 groups according to WHO criteria of BMI:-

Group 1:- Normal (BMI 18.5 – 24.99 kg/m^2)

Group 2:- Underweight (BMI < 18.5 kg/m^2)

Group 3:- Overweight (BMI > 25 kg/m^2)

Inclusion Criteria:The present study included healthy males free of any systemic ailments. Age: 17-25 years.

Exclusion Criteria:-Subjects having history of any kind of systemic disorders, untreated visual & auditory disease, any neuromuscular disorder, sleep disorder, excessive fatigue & fasting ,any kind of alcohol addiction.Also the subjects which are on any kind of medications which may affect reaction time.

Reaction time was recorded with the help of Audiovisual Reaction Time Apparatus, supplied by Medisystem,Yamunanagar , Haryana. It had a display accuracy of 100%. The apparatus has two modes of providing stimulus – Auditory and Visual. Auditory reaction time was recorded for low frequency sound stimuli and Visual reaction time recorded for Red light. Subjects were asked to have adequate sleep at night, to avoid any kind of medication during study period and to come in the department between 8 AM to 10 AM after having light breakfast.

Subjects were asked to respond the stimuli by pressing the response key with the index finger of their dominant hand. The display indicated the reaction time. After familiarizing the subjects with the instrument and after repeated practices, three readings for each stimuli were taken. The interval between the two successive stimuli was randomly varied from 2 to 5 seconds. The least reading of the three was taken as the value for reaction time task. The results expressed as mean ± standard deviation. Data was analyzed using one way ANOVA with post –hoc Tukey's HSD test. $p< 0.05$ was taken as cut off for the measure of significance.

RESULTS

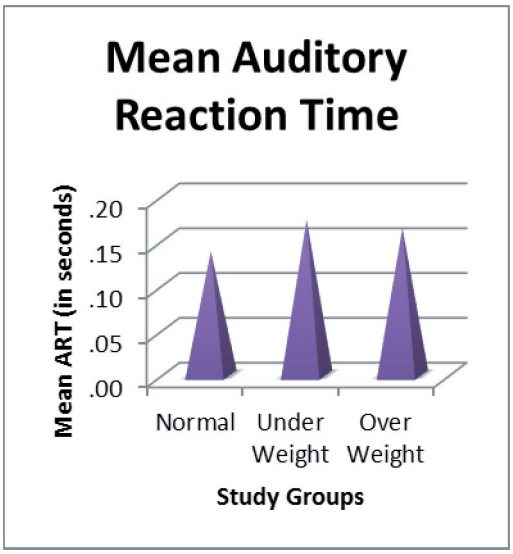
In the present study, BMI was significantly ($p < 0.0001$) different among the three study groups (Table-1). There was prolongation of ART and VRT in underweight as well as overweight groupswhen compared to normal group. Results were significant ($p < 0.0001$) for both ART and VRT.

Table -1: Anthropometric parameters, Auditory Reaction Time and Visual Reaction Time of study subjects.

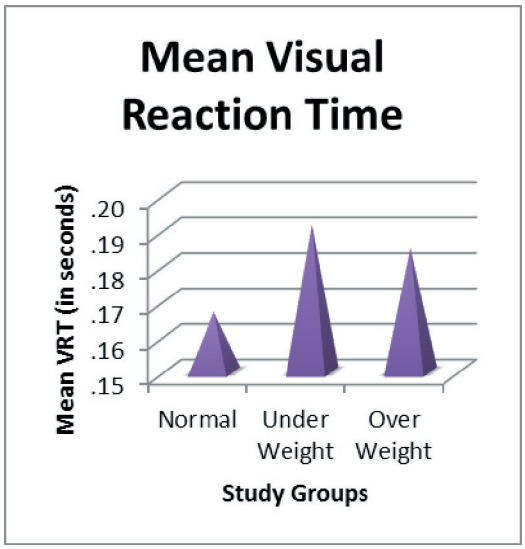
PARAMETER	GROUP 1 Normal (n=40)	GROUP 2 Underweight (n=40)	GROUP 3 Overweight (n=40)	p -value
HEIGHT (m)	1.73 ± 0.070	1.66 ± 0.049	1.74 ± 0.055	< 0.0001*
WEIGHT (Kg)	64.76 ± 8.21	45.72 ± 3.13	83.59 ± 10.25	< 0.0001*
BMI (Kg/m^2)	21.41 ± 1.71	16.59 ± 0.84	27.68 ± 2.52	< 0.0001*
ART (Seconds)	0.138 ± 0.01	0.173 ± 0.02	0.164 ± 0.02	< 0.0001*
VRT (Seconds)	0.167 ± 0.01	0.191 ± 0.02	0.185 ± 0.03	< 0.0001*

* Highly Significant

VRT: Visual Reaction Time; ART: Auditory Reaction Time.



Graph 1



Graph 2

DISCUSSION

Reaction Time is the interval between the onset of a stimulus and the commencement of a movement response [9]. Reaction time can be further broken down into three parts. The first part is perception time – the time for the application and perception of the stimulus and giving the essential reaction to it. The second part is decision time, which signifies the time for giving a suitable response to the stimulus. The third part is motor time, which is the time for compliance to the order received[15].Reaction time as being composed of four stages, namely: the start of eye movements, eye movement time, decision time and muscle contraction time[12].

In present study, the reaction times were longer for the responses to the visual stimuli than for the responses the auditory stimuli. The cause of the visual reaction time being greater than auditory reaction time was not very clear, although almost all of the researches which were done on reaction time had reached the same conclusion[10].

Most likely it was due to the fact that the visual reaction time involved chemical changes in its occurrence. Also, the visual pathway involved many collateral pathways to various association areas and hence, a greater delay in the comprehension of the visual stimulus, as it was interpreted in a more complex and an elaborate fashion. There could have some degree of difference in the type of receptor and the manner in which the receptor got stimulated i.e. the retina versus the organ of corti.

In contrast,another study found that the auditory reaction time was greater than visual reaction time and they rationalized that the auditory pathway must be more polysynaptic as compared to visual pathway[11]. The reaction time is an important component of the motor movements. In the present study, both ART and VRT were increased and statistically significant in underweight and overweight individuals when they were compared to the normal BMI group.

Overweight and obesity, indicated by Body Mass Index have been found to be associated with a host of medical conditions. Neurophysiological studies have shown brain regions involved in cognition, memory, vocabulary, speed processing and reasoning are influenced by BMI[4]

The vascular disease is likely to underlie the association between obesity and cognition, because obesity is a risk factor for the vascular disease, which in turn, is related to a higher risk of the cognitive impairment. Other hypotheses which have been made on the underlying mechanisms concern the secretions of the adipose tissue such as hormones, cytokines and growth factors that can cross the blood-brain barrier and affect the brain health.

Similar study by[13] showed longer reaction time in overweight subjects. Different neurophysiological studies have shown influence of obesity and elevated body mass index on cognitive functions, memory deficits and executive dysfunction in young as well as

middle aged individuals. Theyobserved that in elderly, the association between underweight and the cognitive functions was likely to be the result of a preclinical dementia[5].

Our results on the cross sectional associations between underweight and cognition in the early midlife were consistent with this hypothesis. Underweight could be a result of poor health. A further possibility is that the underweight persons experience a dysregulation in the hormone secretion which corresponds to that in anorexia, that results in cognitive disorders[6].

Some studies have shown that Psychiatric disorders such as Obsessive-Compulsive disorder, Schizoid Personality disorder and Asperger's disorder are associated with a low body mass index, which may be the result of neuroendocrine dysfunction and/or disturbed eating behaviours.[7]

CONCLUSION

This study reveals about different duration of ART & VRT in relation to body mass index.Both the reaction time were prolonged in obese & underweight group compared to normal BMI group.Statistically significant difference was observed among the three groups.

Further studies on the larger group may help us to unleash the underlying mechanism for the difference in values of ART & VRT.

Conflict of Interest- Nil

Source of Funding- Self

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Correlation of Changes of Heart Rate and Intra Ocular Pressure after Isometric Leg Press Exercise Test in Young Adults

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ABSTRACT

Objective: To correlate the heart rate changes to intraocular pressure before and after leg press exercise

Method: Healthy young male adults in the age group of 18-22 years were selected among general population. Sample size was 40. Heart rate and intra ocular pressure (IOP) were recorded at rest and after isometric leg press test.

Results: Leg press predictably raised Heart rate(from74±8.9 to 89.5±7.4;$p<0.05$) and reduced IOP (from 15.1±1.91 to11.6±1.95;$p<0.05$)Heart rate is significantly and negatively correlated with IOP(Pearson's correlation coefficient, **r= -0.352**).

Conclusion: Isometric leg press exercise induces raise in heart rate and simultaneously lowers IOP which were significant. Hence may prove useful in normotensive glaucomatous patients

Keywords: *Heart rate, Intraocular pressure, Leg press dynamometer.*

INTRODUCTION

Glaucoma is chronic progressive optic neuropathy caused by a group of ocular conditions which lead to damage to optic nerve with loss of visual function.Most common risk factor is raised intraocular pressure[1,4,5]. Relationship between isokinetic exercise & IOP showed significant lowering of IOP after exercise.[2,3]

Study of IOP after isometric exercise of large bulky muscles of leg has not yet been carried out.

AIMS & OBJECTIVE

To correlate the heart rate changes to intraocular pressure before and after leg press exercise.

MATERIALS AND METHOD

Fourty healthy young male adults in the age group of 18-22 years with BMI of 18-22.9kg/m^2 were selected fromgeneral population. Heart rate and IOP were recorded at rest and after isometric leg press test. Subjects withpre-existing refractive error, acute and chronicconjunctivitis, glaucoma, migraine were excluded from study.[7]

Materials: • Schiotz tonometer

• Back - Leg lift dynamometer

• Power lab ECG.

Parameters

Study was carried out in physiology department

• Intraocular pressure in mm hg in supine position using standard steps.

• Weight in kilogram & height in meters were measured. BMI=Weight in kg/height in meter^2 was calculated to group them as normal weight.

• Heart rate

• Maximum voluntary contractions(MVC) was assessed and subjects were asked to carry out endurance isometric exercise at 40% of their MVC

Study method –It is a prospective study.

Ethical clearance was obtained from institutionalethical committee. Prior to the procedure

written and informed consent was obtained from all the subjects.

The exercise was performed in a well-ventilated room. Participants were instructed not to consume beverages nor a heavy meal in previous 4 hours or participate in any vigorous activities 24 hour before test.

Isometric endurance contraction at 40% of the individuals MVC was executed with back-leg lift dynamometer.

In order to minimize the bias of diurnal variations of IOP and other parameters, the studies were conducted between 3pm to 4pm.

At the reporting time subjects were asked to relax in supine position for 5min. Baseline IOP was recorded. Subjects executed MVC contractions of 1second duration at 1 minute intervalfor3times.Maximum of these is considered as their MVC .Then endurance contraction at 40% of their MVC is made. Intraocular pressure and Heart rate were measured in supine position immediately (within 30 sec), at five, at ten, at fifteen minutes after exercise.

STATISTICAL ANALYSIS

Mean and Standard deviation was calculated for isometric leg press exercise test in young adults. Paired t-test was applied at 5% level to test the significance of changes in above parameters(Using Epi-Info) Microsoft Excel and EPI-INFO package were used for data entry and statistical analyses respectively.

Correlation was calculated using Pearson's correlation test.

RESULTS

Table 1: Changes in Heart rate ,Right &Left Intraocular pressure.

	Heart rate	Right eye IOP	Left eye IOP
Baseline	74.0500 ± 8.96989	15.1350 ± 1.91506	15.2150 ± 1.93941
Immediate	89.5000 ± 7.39369	11.6200 ± 1.95136	11.1900 ± 1.92791
After 5min	90.0250 ± 8.29423	13.1475 ± 2.24316	12.8525 ± 2.00985
10 min	83.2000 ± 7.89092	14.7025 ± 1.94719	14.4850 ± 1.74907
15min	76.5250 ± 8.92127	15.0350 ± 1.92388	15.1400 ± 1.84916
p value	<0.05	<0.05	<0.05

Leg press predictably raised Heart rate(from74±8.9 to 89.5±7.4;p<0.05)& reduced IOP (from 15.1±1.91 to11.6±1.95;p<0.05).Heart rate is significantly & negatively correlated with IOP(Pearson's correlation coefficient ,**r= -0.352.**

DISCUSSION

- Rise in heart rate has been suggested to be mediated primarily by the central command which is related to number of motor units activated and to reflex effects from active muscle mechanoreceptors. Inhibition of inhibitory cardiac vagal nerve activity also contributes. [8]

- Isometric leg press exercise stimulate ocular sympathetic nervous system to increase the facility of outflow and thus decreases IOP. Also epinephrine stimulates synthesis of cAMP. Activation of cAMP decreases IOP by decreasing aqueous humour production.[6,9]

- Also After leg press exercise there is rise in blood lactate levels. Increased Lactate levels causes outflux of water from eye which is responsible for fall in IOP.

CONCLUSION

Isometric leg press exercise induces raise inheart rate and simultaneously lowers IOP and both were significant. Hence may prove useful in normotensiveglaucomatous patients.

Conflict of Interest: Nil

Ethical Clearance: Ethical clearance was obtained from the institutional ethical clearance committee.

Funding: Self

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An Evaluation of Breath Holding Time between Male and Female in Elderly Population from India

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ABSTRACT

Aims and Objectives:- To collect substantial amount of data relating to physical fitness in elderly peoples.

Materials and Method:- The total sample size was conducted on a randomly selected 110 (84 male and 26 female) apparently healthy subjects of 60 years and above age group belonging to both the sexes. The sample conducted by Department of Physiology and Department of Cardiology, S.N. Medical College, Agra. Breath Holding Time is measured by stop watch. The subject was asked to take a quiet inspiration, and hold it as long as possible. Duration of breath holding was measured by stop watch.

Result:- In elderly men (60+) the average breath holding time (BHT) was 28.20 ± 8.51/sec and in elderly women (60+) 26.11 ± 6.63 sec.

Conclusion:-Breath holding time shows a declining pattern with age in all the age groups of men which is statistically significant ($p < 0.5$). However, in women although the BHT also shows an apparent declining pattern with age in all age groups but the relationship is statistically insignificant ($p > 0.05$). These findings may be helpful for cardiologist with maximum safety and minimum mortality and morbidity or clinicians in reaching the appropriate diagnosis and data relating to physical fitness in elderly peoples.

Keyword:- *Stop watch, Indian population.*

INTRODUCTION

Breath holding is advised to be practised with clotting nostrils by pinching them index finger and ring fingers andapplying three bandhous of jalandhara (fiding chain in jugulas notch, uddiyan (diaphragm control) and nvla (contraction of perinicum). Such elaborate empirical directions seem to indicate that these practices should result in some cardio respiratory parameters. Similarly, the beneficial effect of negative breath holding is expounded by Dr, Brena in his excellent book 'yoga and medicine claim is made but strength of an elephant can be developed by practice of pranayam[1] (Steven F.Brena, 1972).

It is likely that heart rate and blood Pressure change during abdominal exercise because large muscle Co contractions are involved, that the exercises are expected to increase intra-abdominal pressure (IAP), and that some individuals may breathe hold during the exercises[3.5]. Prior research [4,5] has reported potentially injurious blood pressure elevations of up to 345/245 during traditional weight-resistance exercises such as the squat. Consequently, it is of clinical importance to determine the hemodynamic response to common abdominal exercises during the actual exercises

Controlling the breath cannot come easily unless one practices and develop capacities for full utilisation of available oxygen in each breath. By practicing breath control one may develop greater tolerance by checking respiratory stimulation as well as developing capacities for fuller utilisation of available oxygen in each breath[2] (Derikachan,1980).

Breathing techniques are very specialized, because even athletes within the same sport, but competing in different events, have different breathing requirements.

Unlike distance runners, sprinters aren't aiming for aerobic fitness. "Someone who runs the 100 meter dash may want to take one breath and go (Bill Dellinger, 1964).

MATERIAL AND METHOD

The present study sample size was conducted on a randomly selected 110 (86 male,26 female) apparently healthy subjects of 60 years and above age group belonging to both the sexes. The sample size conducted by Department of Physiology and Department of Cardiology, S.N. Medical College, Agra. Breath Holding Time measured by the stop watch in seconds. The subject was asked to take a quiet inspiration, and hold it as long as possible. Duration of breath holding was measured by stop watch. Three readings were taken. Best of the three was taken for record.

1. The survey was conducted at Sheesh Mahal Teela, Taj Garden, Motilal Nehru Garden and Company Garden in Agra. Before assessment of various cardiorespiratory function tests a careful record of both sex and history of any cardiorespiratory distress of each subject was made on a predesigned preformat. At the same time their chest and heart were thoroughly auscultated for any apparent cardiorespiratory distress.

2. Those subjects on whom any suspicion of cardiorespiratory pathology was suspected, or were on any antihypertensive medicine, of any chronic respiratory disease, were not included in the survey study.

OBSERVATION

The present study of evaluation of cardio-respiratory functional ability in elderly age group was conducted with the objective to determine the effect of male and female in elderly population, affect these parameters. Under this endeavor, very simple multidimensional group of various cardiorespiratory function tests comprising of breath holding time, was carried out and studied compare with male and female in elderly population, showing tableno.1

The above outcome of respiratory function tests of the present study happen to be consistent with the findings of earlier studies (Bhargava et al 1973[6] ; Kannel, Helen Hubert and Lew, 1982[7]; Lam et-al., 1983[8] Meenakshi, 1984[9]; Douglas et al.,1985) but the findings are at variance with the findings of Ayub, Zaidi and Burki (1987)[10] and Pathak and Mehrotra (1989)[11]. Ayub, Zaidi and Burki (1973)[10] in their similar study concluded that in Pakistani men maximal respiratory flow rates did not correlate with age, however, in Pakistani women there was a significant correlation of maximal flow rates with age. Pathak and Mehrotra et al. (1989)[11] in their study "Pulmonary Functions of Elderly Indian Subjects" concluded a declining pattern of vital capacity with age but the decline was not uniform.

Though a number of workers have reported the respiratory parameters on Indians, most of the data are on much younger age groups and especially on students. Amongst the reported data available on elderly population, our values are much closer to the values obtained by Pathak and Mehrotra et al. (1989)[11] who studied the respiratory function tests in elderly population of Bombay and Bhargava et al. (1973)[6] who conducted the respiratory function tests in elderly subjects in Bhopal.

The findings of our study are much lower as compared to European contemporary subjects reported by Dreyer et al[12].

Deterioration of respiratory function tests with age might be the resultant effect of a number of factors including the deterioration in the lung tissue; a reduction in the strength of the respirator muscles and an increase in stiffness of the thoracic cage. The intrapulmonary changes are probably partly due to an impairment of the nutrient blood supply from the bronchial arteries; a diminished permeability of cell membrane and an alteration in the molecular structure of the collagen and other tissue, collagen fibers increase in number and change in quality with age.

The changes are likely to have the effect of increasing the rigidity and reducing the tensile strength of the tissue as well as of reducing both the viability of the cells and their recuperative powers. The time course of these manifestations of the process of ageing varies from one individual to another and also in male and female sexes. The ethnic difference between the Indians and others may be aggravated by damages caused by exposure to polluted atmosphere, low socio-economic status, genetic differences, body built and other climatic variables.

Greater decline in respiratory function tests in

tobacco addicts again enjoys a massive support from other workers (Donald I. Peterson et al., 1968[13]; George W. Gomstock et al., 1970[14]; Lower and Khosla, 1972[15]), In their separate work on effect of smoking and respiratory function tests, these workers have also reported a declining pattern in respiratory function tests in tobacco addict. Similar studies were conducted by Carl C, Seltzer et al. (1974)[16], Manfeda et al. (1982)[17], Damodar et al. (1983)[18], Douglas et al. (1985)[19] and they also reported a declining lung function tests in chronic smokers.

RESULTS

In elderly men (60+) the average breath holding time (BHT) was 28.20 ± 8.51/sec and in elderly women (60+) 26.11 ± 6.63 sec. Breath holding time shows a declining pattern with age in all the age groups of men which is statistically significant ($p < 0.5$). However, in women although the BHT also shows an apparent declining pattern with age in all age groups but the relationship is statistically insignificant ($p > 0.05$).

Table-1: Comparative evaluation of breath holding time of total number of male and female subjects studied (N = 110)

Sex	No.	Mean± S.D.
Male	84	28.20 ± 6.63
Female	26	26.11 ± 6.63
	t = 1.39	P >0.05

CONCLUSION

Breath holding time shows a declining pattern with age in all the age groups of men which is statistically significant ($p < 0.5$). However, in women although the BHT also shows an apparent declining pattern with age in all age groups but the relationship is statistically insignificant ($p > 0.05$). These findings may be helpful for cardiologist with maximum safety and minimum mortality and morbidity or clinicians in reaching the appropriate diagnosis and data relating to physical fitness in elderly peoples.

Ethical Clearance - Approved

Source of Funding- Self

Conflict of Interest- Nill

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To Study the Relation between Body Mass Index and Audiovisual Reaction Time in Healthy Young Individuals

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ABSTRACT

Background:- Audiovisual reaction time is time taken by individual to react to auditory and visual stimulus. Body Mass Index influences cognitive functions, attention and memory and hence the reaction time.

Objectives:- To find out the Relation between low body mass index (< 18.5 kg/m2) and Audiovisual reaction time and high body mass index (>25 kg/m2) and audiovisual reaction time.

Method:- Study was conducted in department of Physiology, Mahatma Gandhi Medical College , Jaipur. 40 subjects of normal Body Mass Index (18-24.99KG/M2) were control, 40 subjects with Body Mass Index (BMI) lower than 18kg/m2 and 40 subjects with Body Mass Index higher than 25kg/m2, were cases. Audio visual reaction times were recorded with the help of audiovisual reaction time apparatus supplied by Medisystem, Yamunanagar. Time taken by subjects to respond to both stimuli was noted in each of the three groups.

Result:- In high BMI group, p value for Audio Reaction Time was <0.01 and Visual reaction time, p valve <0.001 .In low BMI group, Audio Reaction Time p valve was <0.001 and for Visual Reaction Time p valve was <0.001.

Conclusion:- • Visual reaction time is longer than Audio reaction time in each group,

• Audio reaction time and Visual reaction time both were prolonged and statistically significant in groups with high BMI and low BMI in comparison to group with Normal BMI.

Keywords:- *Auditory Reaction Time, Body Mass Index, Visual Reaction Time.*

INTRODUCTION

Audiovisual reaction time is the speed, with which a person can respond to an auditory stimulus and visual stimulus respectively[1]. It provides an indirect index of the processing capability of the central nervous system and also a simple means of determining sensori – motor performance[2]. It determines the alertness of a person because how quickly a person responds to a stimulus depends on his reaction time.

Reaction time has physiological significance and is a simple and non invasive test for peripheral as well as central neural structures. Reaction time can be a crucial value in activities like driving and is an important quality of a sportsperson. Reaction time measurement includes the latency in sensory neural code traversing peripheral and central pathways, perceptive and cognitive processing, a motor signal traversing both central and peripheral neuronal structures and finally the latency in the end effector activation (i.e. muscle activation). So any change in reaction time indicates presence of a peripheral and/or central disturbance.

Reaction time is affected by various factors such as Age, Gender, Exercise, Left v/s Right Hand, Fatigue etc. Studies have shown that Body Mass Index (BMI) calculated as Weight (Kg) divided by square of Height (m^2) influences cognitive functions, attention and memory[3,4,5]. Therefore present study was designed to find out whether BMI affects auditory and visual

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reaction time.

MATERIAL AND METHOD

The present study was conducted in the Department of Physiology, Mahatma Gandhi Medical College, Jaipur after getting approval from institutional human ethical committee. For the study, 120 normal, healthy volunteers (17 – 25 yrs.) were taken and categorized into 3 groups according to their Body Mass Index (BMI). 40 subjects were taken in each group.

BMI is calculated by Weight (Kg) / Height (m^2). Height was measured with subject standing without shoes, feet together, eyes looking straight ahead and back in contact with measuring bar of stadiometer. Body weight recorded by a digital weight scale without shoes and with light clothes. Then the subjects were divided into 3 groups according to WHO criteria of BMI:-

Group 1:- Normal (BMI 18.5 – 24.99 kg/m^2)

Group 2:- Underweight (BMI < 18.5 kg/m^2)

Group 3:- Overweight (BMI > 25 kg/m^2)

Inclusion Criteria:

- Age: 17-25 years, healthy Individuals who volunteered for the study after written consent.

Exclusion Criteria:-

- Any acute and chronic illness ,for example hormonal disorders , diabetes , cardiovascular disorders etc.
- Any untreated visual or auditory problems.
- Any neuromuscular disorders.
- Taking any drugs which affect reaction time, for example physcotropic drugs, sedatives etc.
- Sleep disorders.
- Excessive Fatigue/Fasting.
- Smoking/Alcohol.

Reaction time was recorded with the help of Audiovisual Reaction Time Apparatus, supplied by Medisystem ,Yamunanagar , Haryana. It had a display accuracy of 100%. The apparatus has two modes of providing stimulus – Auditory and Visual. Auditory reaction time was recorded for low frequency sound stimuli and Visual reaction time recorded for Red light. Subjects were asked to have 8 hrs sleep at night, to avoid any kind of medication during study period and to come in the department between 8 AM to 10 AM after having light breakfast.

Subjects were asked to respond to the stimuli by pressing the response key with the index finger of their dominant hand. The display indicated the reaction time. After familiarizing the subjects with the instrument and after repeated practices, three readings for each stimuli were taken. The least reading of the three was taken as the value for reaction time task. The results expressed as mean ± standard deviation. Data was analyzed using one way ANOVA with post –hoc Tukey's HSD test. $p < 0.05$ was taken as cut off for the measure of significance.

RESULTS

In the present study, BMI was significantly ($p < 0.0001$) different among the three study groups (Table-1). There was prolongation of ART and VRT in underweight as well as overweight groups when compared to normal group. Results were significant ($p < 0.0001$) for both ART and VRT.

Table -1: Anthropometric parameters, Auditory Reaction Time and Visual Reaction Time of study subjects.

PARAMETER	GROUP 1 Normal (n=40)	GROUP 2 Underweight (n=40)	GROUP 3 Overweight (n=40)	p –value
HEIGHT (m)	1.73 ± 0.070	1.66 ± 0.049	1.74 ± 0.055	< 0.0001*
WEIGHT (Kg)	64.76 ± 8.21	45.72 ± 3.13	83.59 ± 10.25	< 0.0001*
BMI (Kg/m^2)	21.41 ± 1.71	16.59 ± 0.84	27.68 ± 2.52	< 0.0001*
ART (Seconds)	0.138 ± 0.01	0.173 ± 0.02	0.164 ± 0.02	< 0.0001*
VRT (Seconds)	0.167 ± 0.01	0.191 ± 0.02	0.185 ± 0.03	< 0.0001*

*Highly Significant

VRT: Visual Reaction Time; ART: Auditory Reaction Time.

DISCUSSION

Reaction Time is the interval between the onset of a stimulus and the commencement of a movement response [6]. Reaction time can be further broken down into three parts. The first part is perception time – the time for the application and perception of the stimulus and giving the essential reaction to it. The second part is decision time, which signifies the time for giving a suitable response to the stimulus. The third part is motor time, which is the time for compliance to the order received[7]. Singer et al [8] defined reaction time as being composed of four stages, namely: the start of eye movements, eye movement time, decision time and muscle contraction time.

In our study, the reaction times were longer for the

responses to the visual stimuli than for the responses the auditory stimuli. The cause of the visual reaction time being greater than auditory reaction time was not very clear, although almost all of the researches which were done on reaction time had reached the same conclusion[9,10].

Most likely it was due to the fact that the visual reaction time involved chemical changes in its occurrence. Also, the visual pathway involved many collateral pathways to various association areas and hence, a greater delay in the comprehension of the visual stimulus, as it was interpreted in a more complex and an elaborate fashion. There could have some degree of difference in the type of receptor and the manner in which the receptor got stimulated i.e. the retina versus the organ of corti.

In contrast, Shenvi et al[11]; found that the auditory reaction time was greater than visual reaction time and they rationalized that the auditory pathway must be more polysynaptic as compared to visual pathway. The reaction time is an important component of the motor movements. In the present study, both ART and VRT were increased and statistically significant in underweight and overweight individuals when they were compared to the normal BMI group.

Overweight and obesity, indicated by Body Mass Index have been found to be associated with a host of medical conditions. Neurophysiological studies have shown brain regions involved in cognition, memory, vocabulary, speed processing and reasoning are influenced by BMI[2].

Gunstad J et al[2] showed the relationship between the elevated BMI values and the reduced cognitive performance.

The vascular disease is likely to underlie the association between obesity and cognition, because obesity is a risk factor for the vascular disease, which in turn, is related to a higher risk of the cognitive impairment. Other hypotheses which have been made on the underlying mechanisms concern the secretions of the adipose tissue such as hormones, cytokines and growth factors that can cross the blood-brain barrier and affect the brain health.

Similar study by Skurvydas A. et al[12] showed longer reaction time in overweight subjects. Different neurophysiological studies have shown influence of obesity and elevated body mass index on cognitive functions, memory deficits and executive dysfunction in young as well as middle aged individuals[13,14].

Gustafson[14] observed that in the elderly, the association between underweight and the cognitive functions was likely to be the result of a preclinical dementia. Our results on the cross sectional associations between underweight and cognition in the early midlife were consistent with this hypothesis. Underweight could be a result of poor health[15]; a further possibility is that the underweight persons experience a dysregulation in the hormone secretion which corresponds to that in anorexia, that results in cognitive disorders[15].

Some studies have shown that Psychiatric disorders such as Obsessive-Compulsive disorder, Schizoid Personality disorder and Asperger's disorder are associated with a low body mass index, which may be the result of neuroendocrine dysfunction and/or disturbed eating behaviors[16].

Further investigations of the mechanisms which underlie the cumulative effects of underweight on the cognition, would be an important topic for future research.

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Comparative Study of Waist Hip Ratio and Lipid Profile in Offspring of Coronary Heart Disease Patients and Controls

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ABSTRACT

Background: Coronary heart disease is becoming a major cause of mortality in India and the purpose of the study was to identify the risk factors already present in the offspring of CHD patients.

Objective: To study and compare the Waist hip ratio and lipid profile in offspring of coronary heart disease patients and controls.

Materials and method: Study was conducted between 50 subjects (18 – 30 yrs) with parental history of CHD and age and sex matched 50 controls (without the parental history of CHD). Serum lipid profile which included Total cholesterol, LDL, HDL, VLDL, TG levels and TC: HDL ratio was estimated and Waist hip ratio measured. The results were tabulated and statistically analyzed.

Results: Control group had excellent Waist hip ratio (M<0.85, F<0.75) (p=0.05), as compared to study group. Serum TC (p=0.004) and LDL (p=0.006) levels were significantly higher in study group and TC:HDL ratio or risk ratio (p=0.023) was low in control group.

Conclusion: Offspring of CHD patients should be advised to maintain their lipid levels in optimal range and inculcate changes in their lifestyle so as to prevent CHD in future. Intake of junk foods and saturated fat to be avoided and physical activity has to be increased to reduce the risk of CHD.

Keywords: *coronary heart disease; family history; lipid profile ; risk ratio; waist to hip ratio.*

BACKGROUND

Coronary heart disease (CHD) is becoming a major cause of mortality in India. The huge burden of CHD in India is the consequence of the large population and the high prevalence of cardiovascular disease risk factors. WHO reports that one fifths of the deaths in India are caused by CHD. In the year 2020, it would account for one third of all deaths and many of the Indians will be dying young. There are an estimated 45 million patients of CHD in India. [(1)]CHD occurs at a much younger age in Indians as compared to those in North America and Western Europe, as Indians have smaller coronary blood vessels compared to them.[(2)] Hence, ethnicity itself is a risk factor.

Modernization has resulted in a stressful and hectic urban lifestyle in rapidly growing cities like Bangalore. The increasing incidence of CHD is secondary to modernization which has resulted in increased levels of stress, affluence which in turn bring about changes in lifestyle. Obesity is increasing in younger generation due to consumption of calorie rich food and physical inactivity. Family screening of patients with CHD emerges both as an opportunity and challenge of cardiovascular health in 21st century.

CHD is a chronic process that begins during adolescence and slowly progresses throughout life. Independent risk factors include a family history of premature CHD, obesity, DM, Hypertension, hyperlipidemia, smoking and sedentary lifestyle. The first degree relatives of people who develop CHD at an

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early age are at a much higher risk for developing CHD than general population. [3,4] Identification of such people who are at risk of future CHD at a young age helps to prevent and delay the disease by altering lifestyle.

The aim of the study was to identify the risk factors already present in offspring of CHD patient and findings of this study would enlighten the importance of family history while considering CHD resulting from atherosclerosis and to prevent CHD in future.

MATERIALS AND METHOD

A comparative study was conducted in Bengaluru, to assess the influence of family history of CHD on Waist hip ratio (WHR) and lipid profile in 50 offspring (18-30yrs) of CHD patients, by comparing them with the age and gender matched 50 controls without the parental history of CHD. Ethical clearance was taken from Institutional Ethical committee of Bangalore Medical College and Research Institute.

Subjects having Diabetes mellitus, Hypertension. thyrotoxicosis, hypothyroidism and other endocrine disorders, hepatitis or any other liver pathology, musculo-skeletal disorders, smokers, alcoholics, pregnancy, any respiratory pathology, Subjects on medications such as – corticosteroids, hormones or oral contraceptives, beta blockers, diuretics, isotretinoin, antiepileptics, etc were excluded.

Subjects were explained about the study protocol and written informed consent was taken. Waist circumference measured at the midpoint between the iliac crest and the lower margin of the last palpable rib in the mid axillary line. [5] Hip girth measured around the largest circumference of the buttocks, over the minimal clothing, subject standing erect with weight evenly distributed on both feet and legs slightly apart [5] and WHR calculated. After an overnight fast, venous blood sample was collected and estimation of serum lipid profile was done at Central Research Laboratory, Victoria Hospital campus, Bangalore Medical College and Research Institute (BMCRI), Bangalore.

Statistical method[6,7,8]:

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Leven1s test for homogeneity of variance has been performed to assess the homogeneity of variance. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Statistical software: The statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1,MedCalc 9.0.1 and Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel were used.

FINDINGS

Present study is a comparative study consisting of 50 subjects with a family history of CHD (Study group) and 50 subjects without a family history of CHD (control group). Subjects in both the groups were well matched with respect to age (p=0.756) and gender (p=1.000). 44.2% of subjects in control group had excellent WHR (M<0.85, F<0.75) as compared to 20.0% of subjects in study group (p=0.05). 2% subjects in study group had extremely high WHR (M>1.00, F>0.90) and extremely high WHR is an independent risk factor of CHD. [9]

Table 1: Age distribution of two groups studied

Age in years	Group A (Study group)		Group B (Control group)	
	No	%	No	%
18-20	15	30.0	15	30.0
21-25	18	36.0	21	42.0
26-30	17	34.0	14	28.0
Total	50	100.0	50	100.0
Mean ± SD	**23.30±3.77**		**23.06±3.94**	

Samples are age matched with p=0.756

Table 2: Gender distribution of two groups studied

Gender	Group A		Group B	
	No	%	No	%
Male	30	60.0	30	60.0
Female	20	40.0	20	40.0
Total	**50**	**100.0**	**50**	**100.0**

Samples are gender matched with p=1.000

Table 3: Comparison of anthropometric parameters in two groups studied

	Group A (Study group)	Group B (Control group)	P value
Height (cm)	160.82±7.19	159.72±6.76	0.432
Weight (kg)	59.86±7.05	57.84±6.17	0.131
BMI (kg/m^2)	23.11±1.95	22.63±1.43	0.166
WC (cm)	73.90±3.22	72.68±5.85	0.200
HG(cm)	87.58±4.45	87.8±5.07	0.818
WHR	0.85±0.04	0.83±0.06	0.131

Table 4: Comparison of waist –hip ratio in two groups studied

Waist-hip ratio	Group A (Study group)	Group B (Control group)
Excellent (M<0.85, F<0.75)	10(20.0%)	22(44.0%)
Good (M: 0.85-0.90; F:0.75-0.80)	26(52.0%)	19(38.0%)
Average(M:0.90-0.95; F:080-0.85)	12(24.0%)	7(14.0%)
High (M:0.95-1.00; F:0.85-0.90)	1(2.0%)	2(4.0%)
Extreme(M>1.00, F>0.90)	1(2.0%)	0
Total	**50(100.0%)**	**50(100.0%)**
Inference	Excellent WHR is significantly more associated with Group B (44.00%) compared to Group A (20.0%) with P=0.050*	

Table 5: Comparison of serum lipid profile parameters in two groups studied

Lipid parameters	Group A (Study group)	Group B (Control group)	P value
Total cholesterol(mg/dl)	178.68±8.52	174.64±4.49	0.004**
LDL(mg/dl)	109.10±7.62	105.64±4.06	0.006**
HDL(mg/dl)	49.76±4.18	50.56±2.05	0.228
VLDL(mg/dl)	19.82±6.64	18.44±3.29	0.191
Triglycerides (mg/dl)	98.94±33.29	92.12±16.30	0.196
Tchol/HDL	3.63±0.49	3.46±0.16	0.023*

DISCUSSION

Coronary atherosclerosis is the major cause of CHD. The atherosclerotic process is an organised, active, lifelong process involving elements of chronic inflammation followed by repair in artery wall.[10]Atherosclerosis begins with the appearance of fatty streaks in the intima. The fatty streaks may evolve into fibrous plaques by accumulation of lipids, smooth muscle and connective tissue. These plaques undergo vascularisation, intraplaque haemorrhage, rupture, ulceration and calcification and can impede blood flow through an artery. A thrombosis superimposed on a lesion

can lead to myocardial infarction or sudden death.[11]

Abdominal or truncal obesity is accumulation of fat in abdominal viscera, is more associated with metabolic complications. Excess intra-abdominal fat is associated with greater risk of obesity related morbidity than overall adiposity. The WHR shows a graded and highly significant relationship with the risk for MI. Previous studies have shown that measurement of WHR has proved superior to the other indices of obesity in determining the future risk of CHD.[12]

Timothy A Welborn et al found that obesity, as measured by WHR, is a dominant, independent predictive variable for CHD in both men and women. This study showed that the WHR is better predictor for CHD than WC or BMI. [12] WHR may be a better predictor of cardiovascular risk than waist circumference or BMI, as it is less dependent on body size and height. Ideal WHR is <0.85 in men and <0.75 in women. WHR above 1.0 in men and above 0.9 in women is an independent risk factor for higher incidence of CHD.[12]

Grottol et al assessed that those with positive history of CHD in either parent had higher BMI and a greater risk of being obese than those who reported no parental history. Higher mean BMI and obesity (BMI>30Kg/m^2) were associated with paternal CHD history in both sexes and with maternal CHD history among men. [13]

Gupta R et al showed that there was a significant positive correlation of BMI, WHR with fasting blood glucose and LDL cholesterol and negative correlation with physical activity and HDL in both men and women with increasing BMI, waist circumference and WHR, the risk factors increased significantly in both men and women. [14]

M Hippe et al conducted a cross sectional study and found increased cholesterol level, low HDL/TC ratio in subjects with parental history of MI than in controls irrespective of age and sex. Maternal MI was more predictive for increased cholesterol and decrease in HDL/TC ratio than paternal MI, and risk of an increased cholesterol level was higher in subjects aged 20-39 yrs than in older subjects. [15]

Cross sectional study done by Munir Ahmed et al including 250 offspring of CHD patients as study group and 50 offspring without the family history of CHD as control group, where TC, LDL, TG (p<0.01) levels were increased in study group compared to control group. [16]

Saghafi H et al compared first degree relatives of patients with premature CHD with general population. TC and LDL-C levels were higher in 36.8% and 15.3% respectively. 14.6% had low HDL-C and 31.9% had high TG levels. Overall, 60.4% revealed at least one of the lipid abnormalities. [17]

Comparison of lipid profile parameters in both the groups showed TC (p=0.004) and LDL (p=0.006) levels are increased significantly in study group as compared to control group. HDL level is decreased in study group as compared to control group but it is not statistically significant. TG and VLDL levels are also higher in study group than the control group but not statistically significant.TC: HDL ratio is also more in study group than the control group (p=0.023).

Comparison of TC: HDL ratio[18] showed that in study group, 14% of subjects had low risk M [(4.0), F (3.8)] and 4% of subjects had average risk M [(5.0), F (4.5)]. Very low risk [M (<3.4), F (<3.3)] association with CHD was more in control group (98.0%) than the study group (82.0%). HDL is concerned with reverse transport of cholesterol towards liver and has inverse relationship with CHD risk. In our study, offspring of CHD patients have more risk of developing CHD in future.

Obesity leads to impairment of carbohydrate tolerance, elevation of cholesterol level in blood and elevation of body fat and thereby predisposes to atherosclerosis. Obesity is associated with increased basal lipolysis in adipose tissue, and elevated circulating free fatty acids. Families consuming diet rich in cholesterol e.g. eggs, milk, cheese, etc. are at higher risk of developing hypercholesterolemia. There is a linear relation between LDL levels and coronary events. LDL particle has been proved to be the main cause of CHD. [19] Familial hypercholesterolemia results from an absent or defective receptors responsible for internalization of LDL particle, particularly in hepatocytes, caused by LDL receptor gene mutations. High TC (>200mg/dl), high TG (>150mg/dl), high LDL (>130mg/dl) and low HDL (<40mg/dl) according to the criteria of Adult Treatment Panel III, are predominant risk factors for CHD.[17]

Elevation of TC, LDL, VLDL and TG levels and decreased HDL level in offspring with family history of CHD at a relatively young age indicates importance of

compulsory assessment of serum lipids in such children. Dietary cholesterol should be reduced to <200mg%, daily fat intake from 40% to <30% of total calories and intake of monounsaturated and polyunsaturated fats to be increased to reduce the risk of CHD. Inactivity is recognised as a risk factor for CHD. Regular aerobic exercise has been shown to play a major role in primary and secondary prevention of CHD. Exercise controls blood lipid abnormalities by stimulating an increase in plasma HDL concentration and decrease in TG levels. Besides favourable biochemical changes, regular exercise improves working capacity and myocardial oxygen consumption, reduces stress inducible myocardial ischemia and restores psychological balance.

Awareness has to be created in offspring of CHD regarding risk of having CHD in future and they must be advised measures to maintain their lipid levels in optimal range and also regarding weight management. Intake of junk foods and saturated fat to be avoided and physical activity has to be increased so as to prevent or lower the risk of CHD in future.

Conflict of Interest: None

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Effect of Swimming on Cognition in Elderly

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ABSTRACT

Previous studies report reduced risk of cognitive impairment in elderly who maintain higher levels of physical activity. Many studies also have proven that swimming has beneficial effect on skeletal and cardiovascular health. But studies to assess effects of swimming on cognitive health of elderly are lacking. This study was undertaken to assess and compare the level of cognition among elderly swimmers and non swimmers. 40 elderly subjects who regularly swim and 40 elderly non swimmers were recruited based on inclusion and exclusion criteria. Test for the cognitive domain executive function was performed with Category fluency and Verbal N back test to test Fluency and Working memory respectively. Results were statistically analyzed using students t test. In our study Elderly swimmers performed better than non swimmers in both the tests for executive function.

Keywords*: swimming, aerobic exercise, elderly, cognition, executive function, neurogenesis, BDNF, IGF-1, VEGF.*

BACKGROUND

Chronological aging, or senescence, is associated with an increased risk of chronic conditions and diseases such as cognitive impairment, cardiovascular disease, and metabolic syndrome. Due to prolonged life expectancy, age-related diseases have increased in alarming proportions in recent decades. An increasing body of studies have suggested that lifestyle factors have a significant impact on how well people age. Three lifestyle factors can play a significant role in slowing the rate of cognitive decline and preventing dementia: a socially integrated network, cognitive leisure activity, and regular physical activity.[1]

According to the prefrontal-executive theory[2], executive functions (EFs) and their underpinning prefrontal and frontal brain structures are particularly sensitive to the effects of normal and pathological aging[3,4]. Therefore, the preservation of these brain areas and their associated cognitive functions is of particular importance. Chronic physical activity (PA), aimed at improving cardio respiratory health, has been proposed to be a good, practical, and powerful candidate to overcome cerebral and behavioral declines [5-7]. Accordingly, the principal aim of the present study was to examine the potential benefits of an understudied form of PA—regular swimming (one of the most popular and accessible forms of PA for older adults)—on EF performance in a population aged 60 to 80 years old. As swimming is an ideal physical activity for the elderly population because of its low impact on joints and minimal risk of injury. Swimming is also a complete workout, incorporating the entire body and utilizing all muscles groups.[8]

But recently no studies have been done to study the effect of swimming on the age related cognitive decline. So we took up this study to assess and compare the level of cognition among elderly swimmers and non swimmers.

METHODOLOGY

40 elderly subjects aged more than 60 years, who regularly swim at least 30 min for 4 days a week from past 1 yr and 40 elderly non swimmers were recruited. Subjects with untreated cataract, refractory errors, and history of cerebrovascular / cardiovascular accidents, psychiatric illness, Kidney and Liver disorders, Respiratory disorders, Alcohol consumption, and smoking were excluded from the study. And those who perform other regular physical activity were also dropped from the study.

Institutional ethical clearance was obtained prior to the study. Subjects were asked to relax for 30min. And then Participants' written informed consent was obtained after explaining about the study protocol. Later they were

screened for their hearing. The participants were then tested for two sub domains of executive functions i.e. fluency and working memory with Category fluency and Verbal N back test respectively in a silent surrounding.[9]

Category fluency test

In this test the subject was asked to generate the names of as many animals as possible in one minute. The subject is asked to exclude the names of fish, snakes and birds. The number of names generated formed the score.

Verbal N back test

Thirty randomly ordered consonants common to multiple Indian languages were presented auditorily at the rate of one per second. Nine of the thirty consonants were repeated. The consonants which were repeated were randomly chosen. The subjects were asked to respond by tapping the table whenever a consonant was repeated consecutively. Number of hits and errors in each test formed the score. Number of errors was taken as negative score. And then total score was calculated.

The Descriptive statistics were used, i.e. mean and standard deviation (SD) for describing the parameters. The data was analyzed using student t-test to compare between the groups. The difference was considered statistically significant when P0.05. SPSS V.11.0 was used for analysis of data.

RESULTS

Results of present study show significant difference between elderly swimmers and non swimmers in both the tests for working memory and fluency. Wherein nonswimmers had lower cognitive ability compared to the swimmers.

Elderly swimmers were able to name more number of animals in one minute (11.27±1.25) than nonswimmers (9.97±1.31), which was statistically significant which is represented in Table 1

In Verbal N back test which was used to assess working memory elderly swimmers performed better with less number of errors and a total high score (8.05±0.79) compared to nonswimmers (7.27±0.81), represented in Table 1.

Table 1: Comparison of cognitive tests between elderly swimmers and non swimmers.

Cognitive tests	Swimmers	Non Swimmers	P Value
Category Fluency	11.27±1.25	9.97±1.31	0.005 ***
Verbal N Back	8.05±0.79	7.27±0.81	0.004 ***

Note: *P value < 0.05 significant, *** P value < 0.005 highly significant.

DISCUSSION

The growth of the proportion of the population aged 65 and older in the industrialized world, as well as in developing countries, has profound implications for public health and the economic costs of medical care. Cerebral and cognitive decline, as a function of aging, represents a predominant cause of autonomy loss in aging populations. According to the prefrontal-executive theory[2], executive functions (EFs) and their underpinning prefrontal and frontal brain structures are particularly sensitive to the effects of normal and pathological aging [3,4]

Most of the recent literature on aging, fitness, and cognition has shown that chronic exercise would result in selective improvements in executive functions rather than general benefits.[10,11,12]

A meta-analysis by Colcombe and Kramer[10] showed that the effect size of the positive effects of chronic exercise is significantly smaller on information processing speed than on executive functions.

Several studies support the notion that physical activity is a significant moderator of age-related cognitive decline. In cross-sectional studies, age-related differences in cognitive performance observed when older adults are compared to younger participants are reduced if the comparisons involved higher-fit individuals rather than sedentary older adults[13-17]. As a whole, these cross-sectional studies suggest that cardio respiratory fitness is associated with more efficient cognitive functions.

In the present study the comparison was done among Elderly population, between swimmers and nonswimmers. The results show that Elderly swimmers

performed significantly better than non swimmers in terms of Executive function tasks both fluency and working memory.

In Kramer et al.'s[18] study, older adults who completed a six-month aerobic training program (walking) showed a significant improvement in cognitive performance unlike those who completed a stretching program. Cognitive improvement was greater in tasks that tapped attentional control or executive control functions and was correlated with improvement in VO2 max. In another study, Albinet et al. [19] reported that 12 weeks of aerobic training lead to enhanced performance in executive control and increased heart rate variability in older men and women aged 65– 78. These results suggest that aerobic exercise may be an important cardiac and brain protective factor as people age. The greater improvement induced by aerobic training in executive control compared to other cognitive domains has also been confirmed by several meta-analyses.

To the best of our knowledge, only one study was designated to explicitly test the specific relationship between water aerobics and cognitive improvements in older adults [20]. In this study, Hawkins and collaborators examined the influence of a 10-week program of basic swimming skills on variations of two experimental tasks involving processing speed. They found that subjects who trained in water aerobics showed significantly better results than the control group

Better executive function among swimmers than nonswimmers may be attributed to the neuro-protective effect of swimming, an aerobic exercise. It promotes neurogenesis by increasing the production of neurotrophic factors (compounds which promote the growth or survival of neurons), such as brain-derived neurotrophic factor (BDNF), insulin-like growth factor 1 (IGF-1), and vascular endothelial growth factor (VEGF).[21]

CONCLUSION

Swimming has a beneficial effect on cognition in the elderly. Including swimming as a part of day to day activity may help in reducing age related cognitive decline.

Conflict of Interest : The authors declare that there is no conflict of interests regarding publication of this paper

Source of Funding : Self

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Comparative Study on Benefits of Conventional Practical Training Versus Objective Structured Practical Examination in Phase II MBBS Students

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ABSTRACT

Background: The present study was conducted to evaluate and compare the benefits of Conventional Practical Training (CPT) and Objective Structured Practical Examination (OSPE) for Phase II MBBS students.

Material and Method: Study was carried out among II year medical students of Karpagam Faculty of Medical Sciences and Research, Coimbatore. A total of 100 students of both genders were given questionnaire and feedback was taken regarding the benefits of CPT and OSPE in their routine clinical examination in hospital postings and a comparative study was done.

Results: The student's attitude towards the OSPE was found to be positive. OSPE appeared to be the valid index for developing knowledge, communication and psychomotor skills for the MBBS students.

Conclusion: OSPE was found to be a valuable method to improve the competency of a medical student in various domains. Thus OSPE can be used as routine practical examination in basic medical sciences rather than CPT for better learning and application of knowledge in clinical settings.

Keywords: *Conventional Practical Teaching, Objective Structured Practical Examination, Knowledge, psychomotor.*

INTRODUCTION

Objective Structured Practical Examination (OSPE) is derived from Objective Structured Clinical Evaluation (OSCE) in 1975 which was later extended to practical examination and was modified by Hardenand Gleeson[1,2]. This method is now believed to meet the deficiencies of the conventional system of practical examination in medical students. In an international conference held in Ottawain 1985, OSCE and

OSPE techniques were introduced as a teaching and evaluation tool and its advantages were compared with disadvantages[3].

The conventional practical examination system usually involves writing of detailed procedure of one or two given practicals, one as the major and the other minor. It is followed by un-observed performance on self or subject. The assessment is made on the basis of global performance rather than the candidate's individual competency. Some of the problems involved in conventional practical examination include patient and examiner variability which significantly affects the score. In OSPE, individual's competency is given importance by testing the process as well as the product[4].

Considering problems mainly of technical nature, which were faced at some places lead them to develop a combination of conventional and OSPE systems called as SOSPE or Semi Objective Structured Practical

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Examination that involve conduction of one experiment and the student was questioned on it[5].

So this OSPE was reported as good method of practical teaching compared to the conventional practical teaching since it is more objective. OSPE is considered to be the assessment system based on competency levels for practical and procedural skills aiming at producing good products[6].

The OSPE system can offer a better tool for assessment of skill in the basic sciences. A different skill or task is performed by a student at each station[7]. OSPE has been claimed to be a reliable device that has a good capacity to differentiate between different categories of students. It also tests the mental ability and the student's attitude to learning during the time of practical demonstration and performance[8].

The benefits of CPT and OSPE can be compared by taking feedback from the students and therefore the merits and demerits of each method of training can be analyzed. This will help in implementing the better way of practical teaching to fulfill the objectives and to improve the cognitive, affective and psychomotor domains among the medical students[9].

MATERIALS AND METHOD

This was a cross sectional study, conducted in Department of Physiology, Karpagam Faculty of Medical Sciences and Research after obtaining instituitional ethical committee clearance. A total of 100 students from Phase II MBBS participated in this study. Study design and objectives were explained and verbal consent was obtained from the students.

A questionnaire targeting the objectives of practical teaching and their implementation in clinical setting was used to evaluate the benefits of CPT and OSPE in these students. The questionnaire consists of 10 divisions, each division is directed to obtain the feedback from the students regarding their knowledge, analytical skills, ability to perform tasks, confidence level, communication skills etc. These divisions are made common for CPT and OSPE, each student is instructed to answer the questionnaire separately for CPT and OSPE. The scoring for each division was done as follows: (never – 0, rarely – 1, often – 2, always – 3).

From the total scores calculated (out of 30) from the questionnaire separately for CPT and OSPE from each student, they were divided into 3 categories: 21 – 30 as Highly useful, 11 – 20 as Fairly useful, below 10 as Little useful.

Each division in the questionnaire was separately analyzed with the scores given by each student. The total scores obtained for each division under CPT is compared with total scores obtained for each division under OSPE.

The benefits of CPT and OSPE obtained as questionnaire scores is statistically analyzed using paired sample 't' test and results were interpreted.

RESULTS

Table 1 shows the Categorization of System of Practical teaching (CPT and OSPE) based on the scores from the questionnaire given to the students. 36% students marked OSPE type of practical teaching is highly useful when compared to 14% for CPT. Also only 4% students marked OSPE to be little useful whereas in CPT it is 21%. And for the II category fairly useful for both CPT and OSPE method of teaching 60% and 65% of students have marked.

Table 1: Categorization of System of Practical teaching based on student's feedback

Categories	Conventional Practical Teaching (CPT) % of students	Objective Structured Practical Examinations (OSPE) % of Students
Highly useful (21 – 30)	14 %	36 %
Fairly useful (11 – 20)	65 %	60 %
Little useful (below 10)	21 %	4 %

This clearly shows that the OSPE type of practical teaching is beneficial to medical students when compared to conventional type of practical teaching.

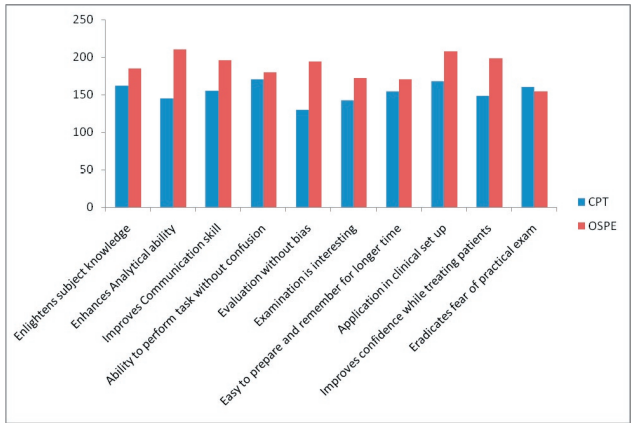

Figure – 1 Comparison of total scores of each division in CPT and OSPE

The total scores obtained for each division in the questionnaire for CPT and OSPE respectively is compared using a bar diagram. All the division except for the division 'Eradicates fear of exam', the scores are high for OSPE when compared to CPT. This clearly indicates the effectiveness of OSPE type of practical training is beneficial over CPT satisfying all the domains of learning.

The total scores which includes sum of all the divisions for CPT and OSPE is statistically analyzed using paired sample 't' test.

Table 2: Paired sample 't' test for CPT and OSPE

Teaching Methodology	Mean	SD	't' Value	'p' value
CPT	153.40	12.41	4.544	0.001*
OSPE	186.70	17.86		

Results obtained from scores of benefits of CPT versus OSPE type of practical teaching methodology were analyzed statistically using paired sample't' test. The 'p' value is 0.001* significant at 5% level. This clearly shows that OSPE type of teaching methodology is highly beneficial over CPT in practical teaching for MBBS students.

DISCUSSION

The significantly higher score of OSPE as compared to Conventional practical training in most of the divisions in the present study indicates importance of OSPE in satisfying the objectives of practical teaching.

OSPE plays a vital role in improving all the aspects of Bloom's taxonomy. It divides educational objectives into three domains – Cognitive, Affective and Psychomotor. The goal of Bloom's taxonomy is to motivate the educators to focus on all three domains, creating a holistic form of education[10].

Cognitive domain is knowledge, comprehension and critical thinking on a particular topic. Affective domain describes the way people react emotionally and ability to feel others agony or joy. Psychomotor domain is the ability to physically manipulate a tool or an instrument. Analyzing the scores of the students, OSPE certainly improves the knowledge, analytical ability, communication skills and motor skills of the medical graduate.

In a previous study, a combination of CPT and OSPE was preferred over pure OSPE. Majority of students considered it as an effective, interesting and useful technique to meet the objectives of the practical teaching. The OSPE system involves wider coverage of the course and it tests individual competency in different topics and skills by asking targeted questions at the Non Observed stations.

On the contrary, the Conventional system evaluates randomly the subjective recall of the given practical. Students both regular and irregular were able to score high in CPT by memorizing the procedure without proper understanding of concepts and facts. OSPE has been shown to have a better scope for being structured so that all the objectives of laboratory teaching can be tested. Instead of the established benefits of OSPE, it is difficult to implement everywhere, due to its limitations. The major reasons are time constraints and space restraints in small setups. However, it has been generally seen that in different medical colleges, the tools of assessment are being continuously switched from one to another. The conventional practical exam had become completely obsolete as it does nor evaluate the student's overall competency level as effectively as OSPE, due to lack of objectivity, purposefulness and focus on important concepts.

CONCLUSION

OSPE appears to be important for performance discrimination on the basis of individual competency,

attitude towards learning and communication skills. It may not only improve the quality of student's performance in laboratory but also improves the ability of a student to apply their knowledge and skills while examining and treating patients.

Both OSPE and Conventional practical training test different abilities. Both have their own advantages and disadvantages. Based on the present results of the study, practical teaching can be modified by incorporating more of OSPE training along with Conventional practical training to improve the knowledge, skills and competency of the medical student and to become a better medical practioner.

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Ethical Clearance: The present study was approved by institutional ethical committee, KFMSR Coimbatore-Tamilnadu

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Conflicts of Interest - Nil

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Reduced Stress Tolerance in Males? An Animal Model

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ABSTRACT

The aim of the study is to understand the affection due to stress in both male and female albino rats. 24 albino rats were used for the study. The animals were divided into two groups, control and study, study group was exposed to heat stress for 10 days and the levels of corticosterone was estimated before and after study. Osmotic fragility was estimated in both the groups. Both the genders were compared and the results tabulated statistically.

Keywords: *Stress, Gender Variation, Corticosterone, Osmotic fragility, albino rats.*

INTRODUCTION

Stress is a reaction that disturbs us both physically and mentally[1] The most detrimental factor that affects the physiology of every living being in various aspects. The research compliments studies which have found that in times of stress, male rats are less likely to survive [2] when people feel stressed their bodies undergo changes through HPA axis and sympathetic system activation.[3] Though it affects every individual ,there exists a gender variation for the same quantum of stress [4] Men and women react differently for the same stress. Such an understanding would have a significant impact, on analyzing the problems faced by each [5]Gender is an important determinant of health, and their exists clear pattern of sex-specific prevalence rates of various problems. This study actually focuses on gender specificity during stress. This was done on experimental animals, albino rats.[6]

MATERIALS AND METHOD

The protocol for the study was approved by Animal Ethical committee, Madurai Kamaraj University, Madurai.

ANIMALS AND EXPERIMENTAL DESIGN

Type of stress: Heat stress

Induction by: 100 watts bulb, to a temperature of 38-40c, for 2 hours everyday for 10 days .

Period of study: 10 days .

Animals Required: 24 albinorats (12 Males & 12 Females) weighing 200gms-225 gms.

Physiological parameters: blood corticosterone level Osmotic fragility.

At the end of the study, these parameters were estimated and statistically analysed .

We studied 24 albino rats of either sex, the animals of same age and weight was taken. 12 males rats were divided into two groups. (control & study group). Likewise 12 female rats were divided into two groups (control & study group). The animals were acclimated to a temperature of 22c with normal feeds and water ad libitum. The study group was exposed to a temperature of 38-41c for 2 hours. Everyday for 10 days. At the end of 10 days, serum corticosterone level and osmotic fragility were estimated. The blood was drawn from the animal using cardiac puncture.

The corticosterone levels were estimated using ELISA method in lab. The osmotic fragility was estimated using saline method. The results were statistically analyzed and tabulated.

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Table 1: Levels of Hormone in Control Group

S.No	Level of hormone	Males	Females
	Corticosterone	2.50 microgram/dl	2.82 microgram /dl

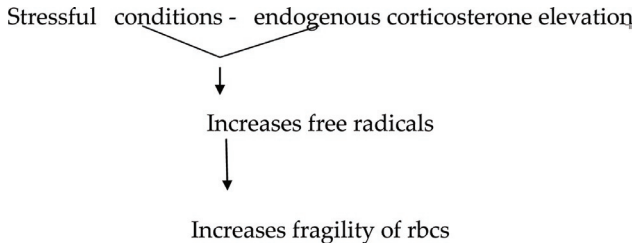
Table 2 Levels of Hormone in Study Group

S.No	Levels of the hormone	Males	Females
	Corticosterone	25.07microgram/dl	22.8microgram/dl

NOTE : The hormone levels after exposure to stress is more in males compared to females.

Table 3 Osmotic fragility

S.NO		Lysis starts	Lysis ends
Control group	male	0.60%	0.30 %
	female	0.60%	0.35%
Study group	male	0.85%	0.40%
	female	0.75%	0.40 %



DISCUSSION

Measurement of erythrocyte osmotic fragility (EOF) could be used as a biomarker of stress in humans. Erythrocyte osmotic fragility is a measure of erythrocyte strength and its ability to withstand varying osmotic gradients and it has being reported to be increased in situations of low oxygen tension, red blood cell membrane abnormality and during oxidative stress [7]

Many researchers have established the response of both genders to a stressor. The activation of sympathetic nervous system, causes release of various hormones.

The hormones like oxytocin, vasopressin, and CRF (corticotrophin releasing factor) are released during stress Among these hormones, oxytocin, counteracts the effects of the stress response.

However oxytocin is present in both males and females, but in greater quantities in females.

Oxytocin works to reduce the blood pressure as well as cortisol, the hormone responsible for facing stress. Oxytocin can induce anti-stress-like effects such as reduction of blood pressure and cortisol levels. It increases pain thresholds, exerts an anxiolytic-like effect and stimulates various types of positive social interaction. In addition, it promotes growth an healing[8]

Actually in our study, female albino rats showed less response to stress, compared to their male counterparts, indicating a possible interference of oxytocin in normal stress response [9]

- Oxytocin – Decreases cortisol, Decreases BP
- Reduces stress by altering the stress cascade
- Central and peripheral oxytocin levels have been found to increase in response to a wide variety of stressful stimuli, such as conditioned fear stimuli and restraint stress [10]. In humans an increase in plasma oxytocin was found after stressful periods.

So, there is definite correlation between stress and oxytocin levels.

CONCLUSION

New researches suggests that stressful events have major impact on mens health, both (mental & physical) than women. As a result of their decreased ability to cope up with stress, they either get affected by diseases like DM, HT or they go in for addiction, aggressiveness and antisocial behavior.

To conclude for the, for the same quantum of stress ,men are more affected than women, and needs an early identification and rectification, which would otherwise result in a major threat to mankind.

Conflict of Interest : Nil

Source of Funding: Self

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Effects of Endurance and Resistance Training on Pulmonary Function Tests: A Randomised Controlled Study

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ABSTRACT

Introduction: Exercise has been a means of testing the physical capabilities and physiological responses of an individual. Exercise when performed regularly has beneficial effects on the various systems of the body. Exercise shows overall improvement in pulmonary function.

Objectives: To evaluate the effects of endurance training and resistance training on Pulmonary function tests.

Methodology: A total of 50 male non-smoker healthy subjects aged 18-25 years were randomized to Group A (n=25; Resistance) and Group B (n=25; Endurance). At baseline FVC, FEV_1, FEV_1/FVC, $FEF_{25-75\%}$, PEF were recorded. The exercise schedule continued till 3 months. After three months, PFTs were revaluated. Changes in pulmonary function were assessed. Data were analyzed using SPSS version 20.0. Student paired't'-tests were used. $P<0.05$ was considered significant.

Results: At baseline both the groups had comparable pulmonary functions. After 3 months, both the groups showed increase in PFT values. FEV_1/FVC was significantly higher in Group B as compared to Group A ($p=0.010$). Group B had higher % increase as compared to Group A for all PFT parameters.

Conclusion: Exercise had a positive impact on PFT with endurance training being slightly better.

***Keywords**: Endurance training Resistance Training Pulmonary function tests Parallel effect*

INTRODUCTION

Exercise has a deterministic effect on heart and lungs. The lungs bring oxygen into the body, provide energy, and remove carbon dioxide. The heart pumps the oxygen to the muscles that are doing the exercise. While exercising muscles work harder and body uses more oxygen and produces more carbon dioxide. To cope with this extra demand, breathing had to increase from about 15 times a minute (12 litres of air), while resting, extra demand is up to about 40–60 times a minute (100 litres of air) during exercise. Circulation also speeds up to take the oxygen to the muscles so that they can keep moving[1]. There are broadly two types of exercises – resistance and endurance. Resistance training targets the muscles, causing them to contract against an external resistance (such as weights) in order to increase strength, tone, mass, and mobility weight-lifting is an example of a resistance exercise while endurance training works on cardiovascular strength and is the most effective way of burning calories fast - Running and swimming are examples of endurance exercise. Cycling is an example of both types of exercise.

Exercise when performed regularly has beneficial effects on the various systems of the body. There are several studies that have shown significant improvement in pulmonary functions as a result of the effect of exercise[2,3,4]. However, there are studies which show non - significant change in pulmonary functions as an effect of exercise[5,6,7]. There are some other studies that present an altogether different scenario. These studies have shown that exercise/sports activities in some particular environments have a deteriorating effect on lung functions resulting into occurrence of asthma and exercised induced bronchoconstriction [8,9,10,11]. These evidences, thus are paradoxical, and as such the issue of effect of exercise on pulmonary functions remains unresolved.

In a recent study, Endurance training (ET) and resistance training (RT) have been considered since the studies show further beneficial effects of strength training on improvement of pulmonary function[12]. Encouraged by these results, the present study was planned with an aim to evaluate and compare the effects of endurance and resistance training on pulmonary functions.

MATERIAL AND METHOD

The study was conducted in the Department of Physiology at King George's Medical University, Lucknow (U.P) between years 2015 to 2016. 50 males apparently healthy non-smoker, normotensive (resting blood pressure <140/90 mmHg) undergraduate students aged 18 to 25 years, having BMI between 18.0 to 25.0 kg/m^2 range were included in the assessment. Those having a history of regular exercise training or sports activity, having previous history of cardiovascular and respiratory problems, those under medication which influence the metabolic or cardiorespiratory response to exercise, having bony deformity of chest or spine, any respiratory epidemic or infection, history of pulmonary embolism, unstable angina or myocardial infarction were excluded from the assessment.

All the subjects were required to fill a **Physical Activity Readiness (PAR-Q)** Form before exercise for screening.

The students were then randomized to one of the two study groups as follows:

- Group A: 25 apparently healthy male subjects for resistance exercise
- Group B: 25 apparently healthy male subjects for endurance exercise

At the time of enrolment, following pulmonary functions were evaluated:

- FVC (Force vital capacity)
- FEV1 (Force Expiratory Volume in 1 sec.)
- FEV1/FVC (Ratio of force expiratory volume in 1 sec to force vital capacity)
- FEF (25-75%) (Force expiratory flow)
- PEF (Peak expiratory flow)

Participants were taken to the exercise physiology lab two times before the beginning of training period. In the first session, their one repeat maximum (1RM) was determined for each of the major muscle group i.e biceps, triceps.

Training Protocol (Based on American College of Sports & Medicine, 2013)

- Each participant performed exercise/training 3 days/week
- 2-4 sets of 8-12 repetitions were done for major muscle groups.

Trial run on treadmill:-

All the subjects were given one session of trial run on the treadmill to relieve the anxiety related to the treadmill running during actual testing and data collection. For examination, all the subjects were advised adequate hydration, avoid heavy physical exertion, complete rest and have a sound sleep on previous night. Subjects were advised to reach the department after taking light breakfast. There was at least a gap of 2 to 3 hours between the last meal and exercise to avoid the nausea and regurgitation. They were then asked to rest for next 30 minutes lying with closed eyes. All subjects for the study underwent through clinical examination (General and Systemic). The ambient temperature of the laboratory was maintained between 20 - 25ºC.

The training was continued for 3 months. After three months, pulmonary functions were evaluated again.

Data Analysis: Data was analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. Independent and paired 't' tests were used to analyze the data. 'p' value less than 0.05 was considered to be statistically significant.

RESULTS

Age of patients ranged from 18 to 24 years. Mean age was 20.60±1.96 and 20.68±1.91 years respectively in Groups A and B. In Group A, mean BMI, heart rate, systolic blood pressure and diastolic blood pressure values were 21.87±1.92 kg/m^2, 75.64±3.15 bpm, 122.24±3.93 mmHg and 75.04±2.95 mmHg respectively whereas in Group B the corresponding values were 21.34±1.87 kg/m^2, 75.28±3.58 bpm, 120.08±6.62 mmHg and 75.12±2.01 mmHg respectively. Statistically, there was no significant difference between two groups with

respect to age, anthropometry and haemodynamic parameters (p>0.05) (Table 1).

Table 1: Comparison of Baseline Demographic, Anthropometric and haemodynamic profile between two study groups

SN	Characteristics	Group A	Group B	Statistical significance ('p' value)
1.	Mean Age±SD (Range) in years	20.60±1.96 (18-24)	20.68±1.91 (18-24)	0.771
2.	Mean BMI±SD (kg/m^2)	21.87±1.92	21.34±1.87	0.323
3.	Mean HR±SD (bpm)	75.64±3.15	75.28±3.58	0.379
4.	Mean SBP±SD (mmHg)	122.24±3.93	120.08±6.62	0.090
5.	Mean DBP±SD (mmHg)	75.04±2.95	75.12±2.01	0.911

At baseline mean FVC, FEV_1, FEV_1/FVC, $FEF_{25-75\%}$ and PEF values were 4.13±0.57L, 3.46±0.50L, 0.83±0.02, 3.79±0.52 L/s and 8.23±0.32 L/s respectively in Group A and 3.98±0.48 L, 3.35±0.41 L, 0.84±0.02, 3.49±0.57L/s and 8.13±0.38 L/s respectively in Group B. Statistically, there was no significant difference between two groups with respect to any of the pulmonary functions being studied (p>0.05) (Table 2).

Post-3 month intervention mean FVC, FEV_1, FEV_1/FVC, $FEF_{25-75\%}$ and PEF values were 4.28±0.51L, 3.69±0.45L, 0.85±0.02, 3.86±0.40 L/s and 8.65±0.30 respectively in Group A and 4.14±0.46L, 3.61±0.35L, 0.87±0.02, 3.77±0.37 L/s and 8.54±0.36 L/s respectively in Group B. Statistically, a significant difference between two groups was observed only for FEV_1/FVC values (p=0.010) (Table 2).

Table 2: Between Group Comparison of Pulmonary function tests at baseline and 3 months post-intervention

SN	Characteristics	Group A	Group B	Statistical significance ('p' value)
Baseline				
1.	FVC (L)	4.13±0.57	3.98±0.48	0.347
2.	FEV1 (L)	3.46±0.50	3.35±0.41	0.434
3.	FEV1/FVC	0.83±0.02	0.84±0.02	0.105
4.	FEF 25-75% (L/s)	3.79±0.52	3.49±0.57	0.054
5.	PEF(L/s)	8.23±0.32	8.13±0.38	0.302
Post-intervention				
1.	FVC (L)	4.28±0.51	4.14±0.46	0.322
2.	FEV1 (L)	3.69±0.45	3.61±0.35	0.503
3.	FEV1/FVC	0.85±0.02	0.87±0.02	0.010
4.	FEF 25-75% (L/s)	3.86±0.40	3.77±0.37	0.405
5.	PEF(L/s)	8.65±0.30	8.54±0.36	0.263

Following intervention mean increases in FVC, FEV_1, FEV_1/FVC, $FEF_{25-75\%}$ and PEF values were 0.15±0.11 L (3.71%), 0.23±0.09 L (6.67%), 0.02±0.02 (2.60%), 0.07±0.32 (1.77%) and 0.42±0.11 (5.06%) respectively in Group A. As compared to baseline, for all the parameters except $FEF_{25-75\%}$, the change was significant statistically (p<0.001) (Table 3). In Group B, mean increases in FVC, FEV_1, FEV_1/FVC, $FEF_{25-75\%}$ and PEF values were 0.16±0.04L (3.94%), 0.26±0.08L (7.62%), 0.03±0.02 (3.43%), 0.28±0.37 L/s (8.01%) and 0.41±0.13 (L/s) (5.09%) respectively. As compared to baseline, the change was significant statistically for all the five PFT parameters being studied (Table 3).

Table 3: Intragroup Change in Pulmonary Function Variables (Pre-Exercise to Post-Exercise)

Pulmonary Function Variables	Group A	Group B						
	Mean Change±SD	% change	't'	'p'	Mean Change	% change	't'	'p'
FVC (L)	0.15±0.11	3.71	6.952	<0.001	0.16±0.04	3.94	18.051	<0.001
FEV1 (L)	0.23±0.09	6.67	12.191	<0.001	0.26±0.08	7.62	16.079	<0.001
FEV1/FVC	0.02±0.02	2.60	6.177	<0.001	0.03±0.02	3.43	7.252	<0.001
FEF 25-75%(L/s)	0.07±0.32	1.77	1.048	0.305	0.28±0.37	8.01	3.803	0.001
PEF (L/s)	0.42±0.11	5.06	18.434	<0.001	0.41±0.13	5.09	16.324	<0.001

DISCUSSION

In present study change in pulmonary functions as observed in Group A (Resistance training) showed a mean % increase in FVC, FEV_1, FEV_1/FVC, $FEF_{25-75\%}$ and PEF as 3.71%, 6.67%, 2.60%, 1.77% and 5.06% respectively whereas the same in Group B (Endurance training) was 3.94%, 7.62%, 3.43%, 8.01% and 5.09% respectively. Thus in resistance training group, maximum change was observed for FEV_1 and minimum for $FEF_{25-75\%}$ whereas in Group B (endurance training), maximum change was observed for $FEF_{25-75\%}$ and minimum for FEV_1/FVC. In both the groups, change from baseline was significant statistically for all the pulmonary function parameters. In effect, the findings showed that pattern of change in different pulmonary functions were different for the two groups under study.

A similar observation was also made by Mehrotra *et al.*[13] who although did not carry out an intervention study yet found pulmonary functions to vary significantly among players playing different sports (football, hockey, volleyball, swimming and basketball). The relevance of exercise training could be equated with the controls (non-players) in their study who had significantly lower values as compared to those playing different sports, thus showing that regular exercise/sports activity has a positive impact on pulmonary functions. In present study, such impact was observed in both the groups, and for all the five pulmonary function parameters being studied. However, some workers like O'Donnell *et al.*[14] did not find a significant impact of 12week endurance training programme on pulmonary functions. However, the difference in type of study population could be specified the reason for this difference between two studies. In present study, all the subjects were young healthy volunteers (18-25 years), however, the cited study had included patients with chronic airflow limitation. Thus the pattern of response could be dependent on the type of patient. In another study, Ortega *et al.*[15] showed a significant change in pulmonary functions of COPD patients undergoing 12week endurance training but did not find a significant change among those undergoing resistance training or a combination of two. In present study too, though the pattern of response for some of the pulmonary function parameters varied across two groups yet in general an improvement in all the pulmonary function parameters (irrespective of magnitude) was observed in both the groups. In general, the findings of the study showed that exercise of either type had a positive impact on pulmonary function. Such observation has also been made in previous studies too. Amonette and Dupler[16] showed a significant improvement in pulmonary functions of both competitive triathletes as well as marathon runners.

There are relatively fewer studies targeted healthy individuals. However, similar to results of our study they have also showed a significant increase in pulmonary functions parameter(s) irrespective of the type of exercise[17,18,19,20,21]. However, these responses were specific for some factors like gender but did not show much difference with respect to type of exercise. In present study too, we did not find a significant difference between two exercise training programmes for most of the parameters except FEV1/FVC.

The findings in present study thus showed that both resistant and endurance training exercises have a positive impact on pulmonary functions. These findings are interesting and show the relevance and importance of exercise in today's world where respiratory disorders, particularly, COPD is expanding extensively. Given the usefulness of either of two training programmes, one can select the type of exercise dependent on the targeted

performance goals. For muscle building resistant exercises are a better option whereas for athletic performances, endurance exercises could be the better option. These results have a high relevance both in terms of application in fitness, performance improvement and pulmonary rehabilitation programmes, however, inclusion of more variables with targeted objectives other than pulmonary functions is recommended.

CONCLUSION

FEV1/FVC ratio in group B(Endurance training) were found to be higher and statistically significant than group A(Resistance training).Increase in pulmonary function variables like FVC, FEV1, FEV1/FVC, FEF25-75% and PEF were found to be higher in group B than group A and change is found to be statistically significant.

Both endurance as well as resistance training programmes provided significant improvement in pulmonary functions.But endurance training being better in achieving targeted goals for exercise.

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Ethical Clearance - Taken

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Effect of Acute Exercise on Pulmonary Function Tests among Young Individuals at Indore, India- A Cross-sectional Study

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ABSTRACT

Background and Aim: The lungs, with their better surface area, are straight open to the outside environment and are greatly prejudiced by epidemiological, environmental and occupational factors. For the functional status of the lungs, pulmonary function testing has major role. Present study was aimed to study the influence of acute exercise on pulmonary function tests in normal young individuals.

Materials and Method: Present study was conducted at Department of Physiology, Index Medical college Hospital and Research Centre, Indore. A total of 102 students comprising of 51 males and 51 females in the age group of 17-22 years were divided into four groups based on their body mass index as Underweight, normal, overweight and obese individuals. Respiratory parameters were measured at rest and after an incremental form of acute exercise in the bicycle ergometer.

Results: No significant changes were observed in all the four groups before and after exercise in males. However the post exercise values of FVC and VC were reduced than the baseline values in overweight and obese females ($p < 0.01$).

Conclusion: Acute exercise did not significantly affect the respiratory parameters. However the body fat distribution of the individual may significantly influence the ventilatory response to acute exercise in otherwise healthy individuals.

Keywords: *Body Mass Index, Exercise, Lungs, Vital Capacity.*

INTRODUCTION

The lungs, with their better surface area, are straight open to the outside environment and are greatly prejudiced by epidemiological, environmental and occupational factors. For the functional status of the lungs, pulmonary function testing has major role. In combination with the clinical assessment and other investigations, they can be used for establishing diagnosis, representing severity of the disease and also in assessing the prognosis.

Exercise symbolizes a situation of physical exertion of the body and it is connected with extensive alterations in the circulatory and respiratory systems. The cardiovascular and respiratory mechanisms function in an incorporated fashion to meet the oxygen demands of the tissues during exercise.[1] Measurement of pulmonary functions after work out could offer valuable information about the functional reserve capacity of lungs both in healthy persons and in patients with respiratory diseases. Exercise is used as a confront test to make a diagnosis of exercise induced bronchoconstriction in asthmatic patients with a history of breathlessness through or subsequent to exertion.[2]

The ventilatory ability of a fit individual often exceeds the demands even during strenuous exercise.[3] Despite this enormous reserve, the ventilatory reply to exercise may become unnatural in obese individuals with normal lungs.[4] Astonishingly very few studies had explored the outcome of acute exercise on pulmonary function tests in normal individuals and they had revealed controversial results.

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Though the relationship of gender and anthropometric indices on lung functions have been well recognized, [5,6] their influence on the exercise persuade changes on pulmonary function tests in young healthy individuals have received less notice. Thus the present study aimed to assess the influence of exercise on pulmonary function tests in young healthy individuals.

MATERIALS AND METHOD

Present study was conducted at Department of Physiology, Index Medical college Hospital and Research Centre, Indore. A total of 102 students comprising of 51 males and 51 females in the age group of 17-22 years were enlist for present cross sectional study. Simple random sampling was used for study participants' recruitment studying at the institution. Students with History of current respiratory infections, allergies, H/o smoking, H/o bronchial asthma etc. were excluded from the study. After obtaining permission from the Institutional ethical committee, the procedure and purpose of the study were clearly stated to all the study participants. Informed consent was obtained from them. A thorough review of their medical history was done, followed by general and systemic examination.

The participants were trained to wear light clothing during their study visits. During anthropometric measurements, the participants were instructed to stand erect with abdomen relaxed, arms at their sides and feet together. Weight (in kilograms) and Height (in centimeters) were measured. Body Mass Index (BMI) was calculated as the ratio of weight and square of Height in meters, using Quetelet Index.

The study participants were divided into four subgroups based on their body mass index

(BMI) in both the genders as:

Group 1 – BMI < 18.5 (Underweight)

Group 2– BMI – 18.5 – 24.9 (Normal)

Group 3– BMI – 25.0 – 29.9 (Overweight)

Group 4 – BMI ≥ 30 (Obese)

Computerised spirometer "Superspiro" was used to measure the pulmonary function tests. The following variables were deliberate – Vital capacity (VC), Forced vital capacity (FVC), and Peak expiratory flow (PEF) at rest. The subjects were asked to make at least three acceptable exercises and the best of the three trials was chosen for reporting.

Exercise testing was done in a computerized bicycle ergometer, with electronic gear shift of 28 gears as well as an intensity ranging from 25 – 800 watts. Each subject was permitted to take rest for 10 minutes, before starting the exercise. Each subject was allowed toundergo incremental exercise, for first 5 minutes in the bicycle ergometer, by increasing the resistance to pedaling (from 25 watts to 50 watts). Then the subject continued cycling at that fixed power, for a period of ten minutes. At the end of exercise, the subject was asked to relax and the pulmonary function parameters were another time measured using the computerized spirometer, within the first 2 minutes after the end of exercise. The results obtained were tabulated and analyzed.

Statistical analysis:

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. The variables were assessed for normality using the Kolmogorov-Smirnov test. Descriptive statistics were calculated. Means of both groups were compared by independent student t-test. **L**evel of significance was set at p=0.05. One way analysis of variance was used for the comparison of the respiratory parameters within various groups of BMI in both the genders at rest.

RESULTS

A total of 102 students were recruited for this cross sectional study, comprising of 51 males and 51 females. Table 1 shows the baseline characte respiratory parameters of the study participants at rest. every respiratory parameters other than FEV1% were significantly higher in males compared to the females ($p < 0.001$). Respiratory parameters before and after acute exercise within the groups in male revealed that VC, FEV1, FVC and PEF were significantly lower in groups 1(underweight), 3 (overweight) and 4 (obese) compared to group 2 (normal)($p< 0.001$). No significant changes were observed in the respiratory parameters after exercise in all the four groups.

Respiratory parameters before and after acute exercise within the groups in female revealed that revealed that VC, FEV1, FVC and PEF were

significantly lower in groups 1(underweight), 3 (overweight) and 4 (obese) compared to group 2 (normal) ($p< 0.001$). However intragroup comparison of the pre and post exercise values revealed that FVC was significantly reduced in 3(overweight) group after exercise and VC was reduced in 4 (obese) group after exercise ($p < 0.01$).

Table 1: Baseline respiratory parameters of the study participants

Gender	Numbers	VC (Mean±SD)	BMI (Mean±SD)	FEV_1 (Mean±SD)	PEF (Mean±SD)
Male	51	3.34±0.74*	24.12±2.66	3.56±0.70*	6.34±1.43*
Female	51	3.05±0.32	23.84±2.69	3.01±0.57	6.01±1.23

BMI – Body mass index, VC – Vital capacity, FEV1 – Forced expiratory volume in first second

* indicates statistically significance at $p\leq0.05$

DISCUSSION

The present cross sectional study designed to study the influence of exercise on pulmonary function tests in young healthy individuals. The baseline values of the respiratory parameters between the genders showed a significant statistical difference, with males showing the higher values. These results are in accordance with other studies and could be explained with the greater muscular strength in males.[5-7] A comparison of the respiratory parameters before work out between the various groups of males and females, revealed a statistically significant influence of body mass index on the pulmonary function. Individuals with a normal body mass index had a significantly higher values contrast to the underweight, overweight and the obese individuals. However there was no change in FEV1 %. These results are in agreement with the results of Saxena et al.[8] and Wannametheeet al.[9] Increased body fat percentage, mechanical limit to the movement of abdomen and thorax and increased airway resistance in overweight and obese individuals, could explain current results. Poor respiratory muscle strength could add to lower values of the respiratory parameters in the underweight individuals as suggested by Muralidhara DV.[10]

Considering the effect of acute exercise, overall no significant change was observed in the respiratory parameters after exercise in males and the underweight and normal females. These results are in accordance with the results of Chen Y et al.[11] However this was in contrast to the findings of Ikram MH, who stated that release of catecholamines during exercise, cause a noteworthy rise in FEV1 after exercise in both the sexes.[12]Lakshmi PVV studied the cardiopulmonary changes with exercise in adolescents and observed an increase in FEV1, but without any changes in FVC. It has also been reported that mild and moderate exercise does not create a significant alteration in the pulmonary function tests in young individuals.[13] In contrast, Sagher F in his study explored the bronchoconstrictor effect of exercise as a fall in PEF, in healthy Libyan children. The bronchospasm in healthy children was accredited to the low temperature and dry stimulus to the airways during exercise.[14] The disparity in the results could be due to the differences in the mode and strength of exercise.

In females, a significant reduction was observed in FVC and VC after acute exercise in individuals with a superior body mass index. However Faria AG et al reported that body fat distribution persuade the resting values more than the changes after exercise.[15]A decrease in lung volumes in persons with higher body mass index appears to increase respiratory resistance, causative to exercise induced reduction in FVC in these subjects as observed by Navarro B et al[16] and Kaplan et al.[17] This reduction being significant only in the females could be explained by the fact that they have slighter respiratory muscle strength and therefore prone for a larger decline of lung volumes and flow rates, which matched with the findings of Canoy D et al.[18]

CONCLUSION

The findings of the present study indicates that pulmonary function tests are not distorted with acute exercise in normal individuals, though exercise induced changes may be considerably influenced by higher body mass index and respiratory muscle strength. This demonstrates that enormous ventilatory reserve in an

individual with regular lungs could be compromised due to many factors like obesity. Although the beneficial effects of constant physical training has demonstrated effects, more research required to be done to discover the beneficial effects of acute exercise and its efficiency as a selection tool in assessing the functional capacity of the lungs.

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Relationship between Lung Function Abnormalities and Duration of Type 2 Diabetes

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ABSTRACT

Background: Diabetes mellitus (DM) is a leading health care problem with long term complications. Studies have shown compromised lung function in type-2 DM but there is still lack of clarity on its relation with disease duration. This study was carried out to determine effect of duration of type-2 DM on pulmonary function.

Objectives: We aimed to investigate if any relation exists between deterioration of lung function and duration of disease.

Material and method: A cross sectional study was carried out on 80 diagnosed type-2 DM patients from the rural population of Sullia who attended KVG medical college OPD, they were non smokers and did not suffer from any cardiopulmonary disease. They were divided in two groups based on disease duration, Group-A had 38 subjects with diabetes for 2-4years and Group-B consisted of 42 subjects with 8-10years of disease. PFT was performed using a digital spirometer (UNI-EM Spiromin). Statistical analysis was done using unpaired t test.

Results: FVC (in L) in Group-A and B was 4±0.67 and 3.06±0.39 respectively with $p<0.0001$. FEV_1 (in L) in Group-A and B was 3.6±0.63 and 2.86±0.34 respectively with $p<0.0001$. FEV1/FVC ratio (in %) in Group-A and B was 90.26±5.08 and 93.74±4.2 respectively with $p=0.03$. So, FVC and FEV_1 showed extremely significant decrease, FEV1/FVC ratio showed significant increase and PEFR on the other hand showed no significant change with increase in duration of diabetes.

Conclusion: PFT findings in this study indicate that, as duration of type-2 DM increases, restrictive lung disease becomes more prominent.

Keyword: *lung function, type 2 diabetes mellitus, spirometry.*

INTRODUCTION

Diabetes mellitus (DM) is a leading health care problem with long term complications. Type 2 diabetes results from the body's ineffective use of insulin.[1] Type 2 diabetes comprises the majority of people with diabetes around the world [1], and is largely the result of excess body weight and physical inactivity. It is associated with an ongoing malfunction of numerous organs, and its complications are mainly a consequence of macrovascular and microvascular damage.

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Several respiratory alterations have been reported in association with diabetes mellitus, mainly insulin-dependent diabetes including elastic recoil[2,3] reduced lung volumes,[2] diminished respiratory muscle performance,[4] decrease in pulmonary diffusion capacity for carbon monoxide.[5-8] The association of reduced lung function and diabetes has been described for many years.[9] Some studies have shown that pulmonary functions are reduced in type 2 DM and duration of diabetes has more influence on pulmonary functions than glycemic control.[10]

If diabetes is detected early and adequate steps are taken, it may be possible to significantly delay the occurrence of complications and there after their progression. A lot of research work is being carried out on the after effects of Diabetes Mellitus on pulmonary

parameters worldwide. Several studies have shown reduced pulmonary function in DM but there is paucity of literature on its relation with disease duration. This study was carried out to determine effect of duration of type-2 DM on pulmonary function. Therefore this study was undertaken to find out the correlation between duration of type 2 DM and Pulmonary function test parameters.

AIMS & OBJECTIVE

To investigate if any relation exists between deterioration of lung function and duration of disease.

MATERIAL & METHOD

A cross sectional study was carried out on 80 patients diagnosed with type-2 DM of age 40-60 years, from the rural population of Sullia who attended the KVG medical college out patient department. Written and informed consent was taken from the study subjects. Ethical clearance was taken from the institute's ethics committee.

Inclusion criteria

Type 2 DM patients of age 40 - 60 years, not involving any exclusion criteria.

Exclusion criteria

1. Patients not willing to participate in the study.
2. Age above 60 years.
3. Patients of known chronic obstructive or restrictive lung disorders.
4. Subjects with history of smoking/ chronic drug intake.
5. Subjects with gross abnormalities of the vertebral column or thoracic cage, neuromuscular disease, malignancy, cardiopulmonary disease or a history of major abdominal or chest surgery.

The study subjects were divided in two groups based on duration of type-2 diabetes mellitus. Group-A had 38 subjects with diabetes for 2-4 years and Group-B consisted of 42 subjects with 8-10 years of disease. A detailed history was obtained and recorded from the control and the study group in the prescribed proforma. Height (in cms) of the subjects was measured in standing and erect posture. Weight (in kgs) was recorded using standard weighing machine in standing posture.

The pulmonary function tests, forced vital capacity test (FVC) and Percentage forced expiratory volume in first second (FEV1) and peak expiratory flow (PEF) were carried out by using the computerized Spirometer-(**UNI-EM** Spiromin) using the standard laboratory methods. A disposable mouth piece was inserted into the sensor housing of the Spiromin ensuring that the mouthpiece was inserted at least 0.5 cm into the housing and was firmly held. The mouthpiece was inserted well into the mouth of the subject (beyond the teeth) and the mouth must be closed around the mouthpiece to ensure that air cannot escape from the sides of the mouth. A nose clip was fitted to the nose of the subject to ensure that no air can escape through the nostrils. The subject was asked to hold the spiromin either in two hands (one at each end) or as an alternative in one hand.

The relevant data of the subject (age, sex, height in cm and weight in kg) were fed into the Spirometer. The test module was activated and the subject was given proper instructions about the procedure to be performed. All the pulmonary function tests were done on the subjects in standing position. During the test the subject was adequately encouraged to perform his/her optimum level.

FVC test

The subject was asked to breathe at rest for a few moments, and then inspire slowly as much air as possible and then make a complete expiration as fast as possible, to complete the cycle by inspiring again as quickly as possible.

Parameters recorded during FVC test

1. FVC (forced vital capacity)
2. FEV1 (forced expiratory volume at the end of first second)
3. PEF (peak expiratory flow)
4. FEV1/FVC ratio

Statistical analysis was done using unpaired t test.

OBSERVATION & RESULTS

The data which has been presented in Table-1 shows that there were 38 type 2 diabetes patients who had the

disease for 2-4 years made up 47.5% of the study population belonged to Group A. Group B comprising of 52.5% of the study population were the ones who had type 2 DM for 8-10 years.

Table-1: Division of diabetic population based on duration of disease

Duration	Number	%
Group A	38	47.5
Group B	42	52.5

Table 2 and Table 3 show that no significant difference ($p > 0.05$) is there between the physical characteristics of group A and group B subjects on statistical analyses of age, sex, height, weight and BMI.

Table-2: Age and gender distribution of study subjects

Groups	N	Age (Yrs)	Sex	
			Male	Female
Group A	38	52.60 ± 3.1	20	18
Group B	42	52.52 ± 3.2	22	20
Significance	p	> 0.05, NS	>0.05, NS	

All values are expressed as Mean ± SD Analysis of all parameters done by Independent T- test, HS-Highly significant, S- Significant, NS-Not significant

Table-3: Physical characteristics of study subjects

Groups	Height (meter)	Weight (Kg)	BMI (kg/m^2)
	Mean ± SD	Mean ± SD	Mean± SD
Group A	1.73 ± 0.05	66.76 ± 11.11	22.32 ± 3.33
Group B	1.71 ± 0.07	66.12 ± 11.71	22.38 ± 3.21
Significance p	> 0.05, NS	> 0.05, NS	> 0.05, NS

Analysis of parameters done by Independent T- test HS-Highly significant, S- Significant, NS-Not significant

Table 4: Comparison of pulmonary function test between the groups

	Group A	Group B	Significance p
FVC (in l)	4.00 ± 0.67	3.06 ± 0.39	<0.0001, HS
FEV_1 (in l)	3.60 ± 0.63	2.86 ± 0.34	< 0.0001, HS
FEV_1/FVC (%)	90.26 ± 5.1	93.74 ± 4.2	< 0.05, S
PEFR (l/sec)	5.00 ± 2.2	5.2 ± 1.7	> 0.05, NS

All values are expressed as Mean ± SD, Analysis of all parameters done by Independent T- test , HS-Highly significant, S- significant, NS-Not significant

It is evident from Table-4 that in group B subjects there was a highly significant decrease in the FVC and FEV_1 as compared to group A individuals. FEV1/FVC showed significant increase and PEFR showed no significant change in group B as compared to group A.

DISCUSSION

In this study, there was no significant difference in anthropometric parameters between group A and group B. These being the major determinants of spirometric values, the main determinants of ventilatory differences are likely to be the duration of diabetes.

In this study we found that statistically there was a highly significant decrease in the level of FVC and FEV1 in diabetics with 8-10 yrs of diabetes compared to those with 2-4 yrs of the disease. FEV1/FVC showed significant increase and PEFR showed no significant change with increased duration of disease (Table 1).

Similar findings were reported in their study by Meo SA et al.[11] & Anand R et al. who concluded that lung functions were negatively correlated with glycemic status and duration of diabetes (r = –0.390, & –0.342).[12]

In a study by Robert E. Walter[13] with duration of the disease, the ratio was increased by 1.5% in diabetics which was stastically significant. Similar to our findings.

Similarly, Meo et al.[14] in their study showed a significant reduction in FVC for patients with diabetes of duration of 5–12 years compared with their matched controls and patients with diabetes with duration of disease more than 12 years showed a significant reduction in FVC, FEV1, and FEF25–75% relative to their matched controls.

Rosenecker et al.[15] reported that in patients with diabetes, FVC and FEV1 declined significantly over the 5-year study period. Patients without diabetes did not experience a significant decline in these measurements during the study period.

PEFR was seen to be reduced but not significantly in our study. Similarly, in a study by Kanya KDH et al.,[16] no change in PEFR values in diabetics was observed as the duration of diabetes increased indicative for restrictive pattern.

CONCLUSION

Lung volumes including FVC, FEV1, PEFR, and FEV1/FVC using digital spirometer were recorded to test the pulmonary functions. Significantly higher lung volumes were seen in the group with shorter (2-4yrs) duration of diabetes as compared to longer (8-10yrs) duration of diabetes group. Hence, significant increase in restrictive pattern of pulmonary function was seen with increased duration of diabetes.

Ethical Clearance- Taken

Source of Funding- Self

Conflict of Interest - Nil

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Thyroid Hormone Levels in Patients with Polycystic Ovarian Syndrome

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ABSTRACT

Context: Polycystic ovarian syndrome, commonly known as PCOS, is an endocrine disorder seen in women of reproductive age. Polycystic ovarian syndrome is estimated to effect 4-12% of women throughout the world and is most commonly characterized by hyperandrogenism and insulin resistance each of which affect 60% to 80% of PCOS patients and 50-80% of PCOS women respectively. **Aims**:To evaluate the levels of thyroid hormones in women with PCOS. **Method** :80 female patients with PCOS based on Rotterdam criteria,80 volunteer females included as controls , serum levels of TSH, T3 and T4 were tested in two groups. **Results** Significant increase in TSH along with a significant decrease in T3 and T4 in PCOS females matched against controls ($p< 0.05$).

Conclusion PCOS is linked to hypothyroidism and more studies should be carried to reveal the precise relationship.

Keywords: *Thyroid hormones, polycystic ovarian syndrome, T3, T4, TSH*

INTRODUCTION

Polycystic ovarian syndrome (PCOS) [the major endocrinopathy of females in the reproductive age] and the thyroid disorders are the two most common endocrine disorders in the general population and though these both disorders differ in etiopathogenesis , these two entities have common features[2]. Polycystic ovarian syndrome (PCOS) also called as Stein- Leventhal syndrome causes the signs and symptoms due to elevated male hormone in women[10]. These include irregular or no menstrual periods, excess body and facial hair, acne, pelvic pain, patches of thick, darker and valvetty skin[10]. During the reproductive years, PCOS is associated with important reproductive morbidity including infertility, irregular uterine bleeding and increased pregnancy loss[10]. Associated with increased cardiovascular and metabolic risk factors like type 2 diabetes, obesity, obstructive sleep apnoea, mood disorders, heart disease and endometrial cancer[3]. The first recognition of an association between glucose intolerance and hyperandrogenism (HA) was the famous report of the bearded diabetic woman by Archard and Thiers in 1921[4].The level of thyrotropin releasing hormone (TRH) in primary hypothyroidism is raised which leads to rise in prolactin and thyroid stimulating hormone (TSH)[2]. The change in the ratio of follicle stimulating hormone (FSH) and Leutinizing hormone(LH) and increased DHEA from the adrenal gland, all these contributes towards polycystic morphology by inhibing ovulation[2]. Increased TSH also has its effects on FSH receptors. Increased TSH also contributes in the deposition of collagen in the ovaries[2]. According to the study conducted by Muderris *et al*, twenty six females on treatment for primary hypothyroidism with mean TSH 57.1mcg/dl underwent evaluation of ovarian volumes before and after replacement with thyroxine[2]. Out of twenty six, ten of the hypothyroid females had polycystic appearing ovaries on ultrasound sonography test[2]. All the women with primary hypothyroidism had significantly higher ovarian volumes than controls[2]. Normalization of ovarian volumes in all patients with or without polycystic appearing ovaries , after replacement with thyroxine[2]. Consistent regression of the ovarian cysts after thyroid hormone replacement therapy supports a causal relationship between hypothyroidism and ovarian stimulation[5]. Speculation regarding the autoimmune thyroiditis, which predisposes subjects to develop characteristics suggestive of PCOS or whether PCOS is the forerunner of autoimmune thyroiditis is not yet cleared[2]. The aim of the present study is to evaluate

thyroid hormones level and their role in women with polycystic ovarian syndrome.

MATERIALS AND METHOD

The study was conducted on the subjects attending the out patient clinic in M.R.Medical college & Teaching Hospital , Gulbarga, Karnataka between July 2012 to Feburary 2013. The study included 80 female patients suffering from PCOS. Diagnosis of PCOS is made according to the Rotterdam European Society for Human Reproduction and Embryology/ American Society for Reproductive Medicine. The protocol was approved by the local ethics committee. All the patients gave a written consent.The Control group (n= 80) consisted of healthy subjects without any systemic disorder. Free T3, Free T4 and TSH concentration were measured by mini-VIDIS.

Inclusion criteria

- Female between 18 to 39 years of age
- Presented with clinical history of PCOS and Hypothyroidism.

Exclusion criteria

- Female below 18years and over the age of 39years were excluded from the study
- Diabetes Mellitus
- Hperprolactinemia
- Congenital adrenal hyperplasia
- Androgen secreting tumours
- Cushing syndrome
- Infection diseases
- Hypertension
- Medications including OC pills, antilipidemic drugs, insulin sensitizing drugs, within 3 months before enrolement.

STATISTICAL ANALYSIS

All data analysed using the Statistical Package for Social Sciences (SPSS) software computer program version 20.0.

Data expressed as mean ± Standard Deviation(SD) following analysis using independent t-test. A value of $p<0.05$ was considered significant.

RESULTS

Table 1: Serum level of TSH in women with PCOS were significantly elevated compared to healthy control group. Serum level of free T4 and free T3 were significantly decreased compared to healthy control group.

Parameters	Patients n=80	Control n =80	P-value
TSH	8.2 ± 8.0	1.6± 1.2	0.00*
Free T4	0.3 ± 0.2	1.0 ± 0.2	0.00*
Free T3	5.4 ± 1.8	9.2 ± 2.0	0.00*

Table shows mean ± SD and probability (p) *

*P – value < 0.05 is considered significant

DISCUSSION

The prevalence of subclinical thyroid dysfunction in reproductive years is about 4-6%[2].Various publications have reported increased incidence of thyroid disorders in females with PCOS[2].A higher prevalance (26.9% versus 8.3% of controls) of autoimmune thyroiditis (AIT) in PCOS has been reported in one study to date[7]. Sinha et al, compared 80 PCOS females with 80 controls and found significant higher prevalance of goiter in PCOS as compared to controls[2]. Janssen et al, documented a high mean level of TSH in PCOS patients[1]. Ghosh et al, analysed the part of hypothyroids in the causation of PCOS and proposed that hypothyroidism resulted in reducing sex hormone binding globulin level and increament of testosterone level[1]. The most obvious connection between PCOS and hypothyroidism is increased BMI and insulin resistance common to both conditions[2]. Experimental studies have shown that in normal conditions, thyroid hormones may influence the expression or activation of uncoupling protein, b-adrenergic receptor, and peroxisome proliferator-activated receptor-gamma, all of which are involved in regulating insulin sensitivity (Frederiksen et al., 2002; Dallongeville et al., 2003; Wang et al., 2004)[8]. The association of IR and hyperinsulinemia of PCOS with elevation of various cytokines such as IL-4, IL-6, TNF-a, and their alteration after treatment with insulin sensitizers is well established[9]. Obesity is

associated with increase in proinflammatory markers and increase in insulin resistance[2]. This leads to decreased deiodinase-2 activity at pituitary level resulting in relative T3 deficiency and increase in TSH levels[2]. High insulin levels cause the pituitary gland to make too much luteinzing hormone (LH) and too much LH causes overproduction of testosterone, these hindering ovulation[10]. Kachuei et al, found that women with PCOS had a 65% increase in thyroid peroxidase antibodies and a 26.6% increase in the incidence of goiter, when compared to age matched subjects[10]. It has been proposed that women with Subclinical hypothyroidism and ovulatory dysfunction, infertility, or desire to become pregnant should be treated[6].Our study revealed a significant increase in mean ± SD level of serum TSH level in PCOS patients in contrast to controls[1]. In this study there was a significant decrease in mean ± SD level of serum T4 and T3 in PCOS women compared with those in control group.

CONCLUSION

The study suggests that hypothyroidism is related to PCOS and this will lead to autoimmune disease. Thyroid health has a profound impact on the pathology of PCOS affecting all aspects of disorder[10]. Correcting subclinical hypothyroidism is the key in improving overall hormonal and metabolic health[10]. Doctors should look at the specific relationships that exist in each and every patient to create a plan that helps to restore optimal metabolic and hormonal health[10].

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Predominance of Multi Modality Preferences in both Males and Female I Year Medical Students, Using VARK Questionnaire

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ABSTRACT

Background: The sensory modality which we use to assimilate and learn information may be visual (V), auditory (A), read-write (%) or Kinesthetic (K). Individuals who prefer one modality are said to be unimodal and those preferring two or more than two sensory modality are multimodal. Medical students are no exception to this. Males and females excel differently from each other as males have better spatial ability and females have better language ability. The aim of our study was to find out whether there were any differences in sensory modality preferences between male and female I year medical students.

Method: The VARK 7.8 questionnaire in paper pencil format was distributed to the students of I year MBBS. Students were informed that they should complete the form and fill up gender information which was entirely voluntary. The completed forms with gender information was collected randomly from 60 males and 60 females. The completed forms were processed and the learning style preferences based on VARK was determined.

Results: Multimodality was the most dominant preference with 66% of males and an equal percentage of females preferring two or more of the modalities. Chi-square test did not find any significant difference between learning modality preferences in Males and females.

Conclusion: There are no significant differences between males and females with respect to VARK learning style preferences.

Keywords: *VARK , Medical students, gender differences, multimodal, unimodal, Visual, auditory, kinesthetic*

BACKGROUND

Each of us assimilate information by using one or more of our sensory modalities. While some of us prefer visual (V) modality and hence learn best by seeing pictures and maps, some others may be auditory (A) and they would prefer hearing information and learn best by assimilating information through auditory modality. While some others prefer read write mode(R) and may assimilate best from reading books, a few others may prefer kinesthetic modality (K) and assimilate best by manipulating models or doing an experiment [1, 2]. Individuals could have single strong preference that is, they could have a unimodal preference or they could have multimodal preference where they learn best by assimilating information through more than one sensory modality. Medical students also have their own preferences in assimilating information. Just as we cannot feed a stork food in a flat plate, knowledge of student preferences is required for reasons of pedagogy.

Research has revealed that male and female brains are quite different. For example, boys have better spatial ability whereas girls have better language skills[3]. Furthermore, attention deficit hyperactivity disorder in more common in males whereas inattention is more common among girls[4]. I hypothesize that there are differences in sensory modality preferences between male and female medical students.

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SUBJECTS, MATERIALS AND METHODOLOGY

Population: I year medical students /freshers were included in the research project.

Design: comparative study design

Instrument: The VARK questionnaire 7.8 devised and improvised by Fleming was used in pencil paper format. The questionnaire has 16 questions. Each question presents a real life situation which could be solved in one of the 4 ways as the answers given to each question. Students can use one or more of the 4 sensory modality preferences to solve the real life situation. The students were instructed to complete the questionnaire in the next 10-15 minutes.

Methodology

Design: The hard copy of the questionnaire was distributed to all the 210 students studying in I year MBBS. Students were informed that they should write their age and gender on the first page of the questionnaire and to return the completed VARK 7.8 questionnaire. Students were also instructed that offering gender information was entirely voluntary. 60 male and 60 female I year medical students whose VARK questionnaire was complete with respect to gender information were included in the study.

Statistical analysis: Data were entered in Microsoft excel and was represented by pie charts. Comparison of learning preference in two groups male and female genders was compared using chi square test. Significance was at $P<0.05$

The following chart shows selected few questions provided in the VARK questionnaire 7.8

Choose the answer which best explains your preference and circle the letter(s) next to it. **Please circle more than one** if a single answer does not match your perception.

Leave blank any question that does not apply.

1. You are helping someone who wants to go to the airport, the center of town or railway station. You would:

a. go with her.

b. tell her the directions.

c. write down the directions.

d. draw, or show her a map, or give her a map.

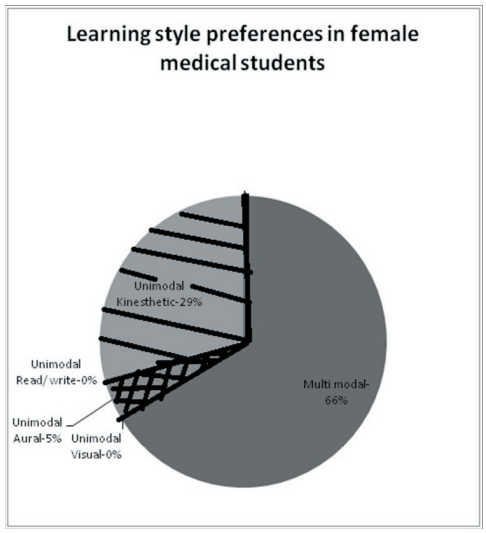
2. You are planning a vacation for a group. You want some feedback from them about the plan. You would:

a. describe some of the highlights they will experience.

b. use a map to show them the places.

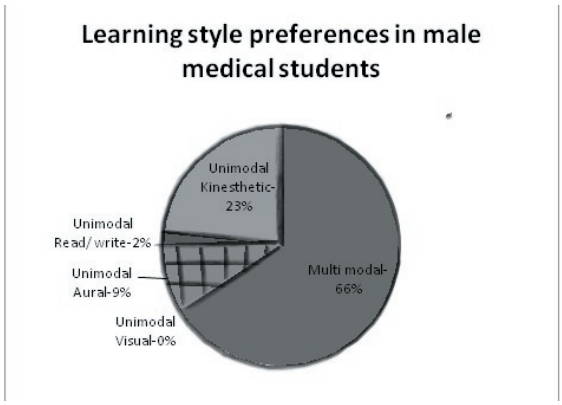
c. give them a copy of the printed itinerary.

d. phone, text or email them.



Graph 1-

Graph 1 shows percentages of females with multimodal preferences, unimodal visual, unimodal auditory, unimodal read write and unimodal kinesthetic references



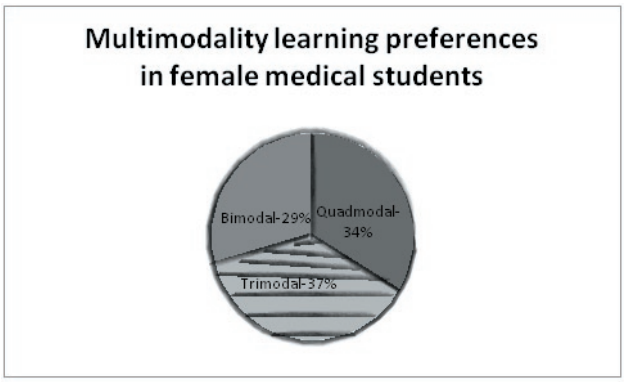
Graph 2

Graph 2-Shows percentages of males with multimodal preferences, unimodal visual, unimodal auditory, unimodal read-write and unimodal kinesthetic preferences

Contingency Table 1:

	MALES	FEMALES	P
Unimodal visual	0	0	Chi-square -2.28 P=0.699(Not significant)
Unimodal Aural	6	3	
Unimodal read write	1	0	
Unimodal kinesthetic	15	18	
Multimodal	43	41	

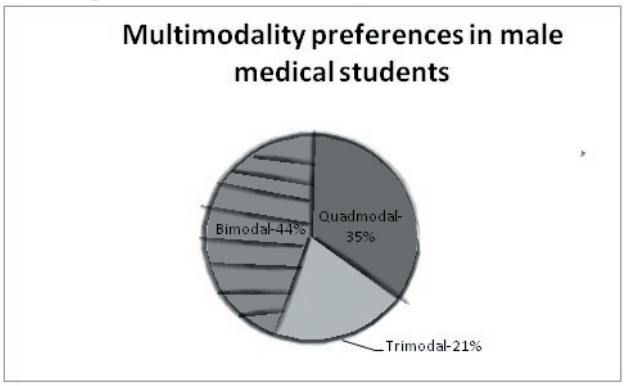
Graph 3



Graph 3 shows how females with multimodality preferences could be further subdivided into those with bimodal, trimodal and quad modal preferences.

Graph 4

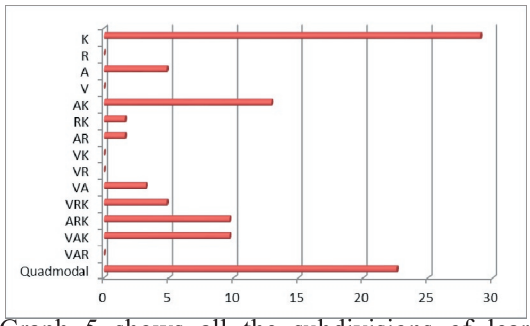
Graph4 shows Subdivisions of males with multimodality preferences into bimodal, Trimodal and quadmodal preferences.



Contingency table 2

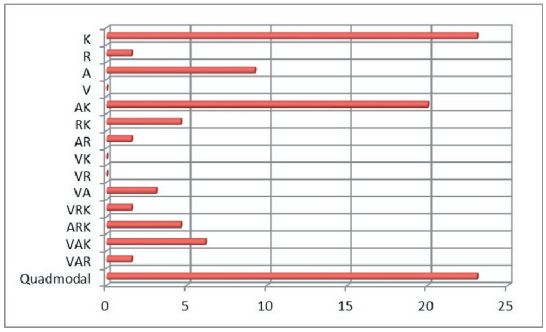
	Males	**Females**	**P**
Bimodal	15	14	Chi-square-3.07 P=0.22(Not significant)
Trimodal	9	15	
Quadmodal	19	12	

Graph 5



Graph 5 shows all the subdivisions of learning modality preferences with the horizontal bars representing percentages of females in each subdivision of learning modality preferences.

Graph 6



Graph 6 shows all the subdivisions of learning modality preferences with the horizontal bars representing percentages of males in each subdivision of learning modality preferences

RESULTS

Graph 1 shows sensory modality preferences in I year female medical students.66% of female students had multimodal preference. The rest had unimodal preferences. Among female students, 29% of them were unimodal kinesthetic while 5% had unimodal auditory preferences. Unimodal with visual and unimodal with read write were nil.

Graph 2 shows learning preferences in male medical students. 66% of the males had multimodal preferences.

Among male students, 23% had unimodal kinesthetic preferences. Unimodal auditory preference was found in 9% of males, 2% had unimodal read write preferences and none had unimodal visual preferences.

Table 1 shows the contingency table as observed in female students where number of students in each category of unimodal, and multimodal (depicted as a single group). Chi square was found to be insignificant

Graph 3 shows that, of the female students who had multimodal preferences, 29% had bimodal, 37%had Trimodal preferences and 34% had quad modal preferences.

Graph 4 shows that, of the male students who had multimodal preferences, 44% of the multimodal males had bimodal, 21% had Trimodal and 35% had quad modal preferences.

Table 2 shows the contingency table representing the subdivisions of the multimodal group. Chi-square test showed no significant difference between males and females.

Graph 5 and 6 show each modality and their combinations expressed as horizontal bars in female and male I year medical students respectively. While the X axis represents Percentages, the Y axis denotes various modalities.

Graph 5 shows that the largest group among females was the unimodal Kinesthetic at 29%. The second largest was quadmodal (VARK) at 23%. AK, ARK, VAK, VRK followed quadmodal in descending order of popularity. K is a component in all combinations of popular multimode preferences while R, VK, VR and VAR preferences were absent.

Graph 6 shows that among males, Unimodal kinesthetic and quadmodal were popular groups, with 23% of males opting for unimodal kinesthetic and 23% opting for quadmodal preferences.. The next popular preference was AK at 19.5 % and V, VK and VR were unpopular at 0%.

DISCUSSION

Multimodal learning preference was found to be popular among both female and male I year medical students. Sixty six percent of male and same percentage among females was found to be multimodal. Multi modal means a preference of two or more sensory modality for assimilating information. Slater et al found 56.1% males and 56.6% females were multimodal[5]. Dissanayake found no difference between men and female physiotherapy students. Only 26% had multimodal preferences in the Srilankan study on physiotherapy students[6]. Mitesh Sinha found that 46% females were found to be multimodal while 82% of male medical students were found to be multimodal[7]. Werheim et al found 87.5% of males and 45.8% of females to have multimodal learning preference[8]. We can observe from this that while Slater et al and Dissanayake et did not find any gender differences , Werheim et al and Mitesh Sinha et al found differences between the males and females with respect to sensory modality preferences.

Table 1 shows the contingency table where number of students in each category of unimodals, and multimodals (depicted as a single group). Chi square test showed that these values were not significant[9].

Werheim et al conducted research on gender differences in learning style preferences in undergraduate physiology students. He found that while majority of males preferred multimodal, females preferred Unimodal learning preferences. In our study, 29% of the female students were unimodal kinesthetic while 5% had aural preference. Unimodal with visual and unimodal with read write were nil. 23% of the males were unimodal kinesthetic. Aural preference was found in 9% of males, Unimodal read write was at 2% and unimodal visual at 0%. According to research literature, Asiabar found 48.4% of the sample to be unimodal[10]. Among the unimodal, read write was 21.7%, aural was at 18.5% and 6.5% preferred kinesthetic and1.6% preferred visual in contrast to our study where most of the unimodal among females had kinesthetic preference at 29% among females. Mitesh Sinha et al found that among the unimodal which consisted of 54% of the female sample and 18% of the male sample, those with aural preference were the largest group among unimodal females and among the 18% of males who were unimodal, two largest groups were 8%with aural preference and 8% were kinesthetic[7].

In our study, in the multimodal category, multimodality consisted of bimodal 29%, Trimodal 37% and quad modal were at 34% in female medical students. 44% of the multimodal males were bimodal, 21% were Trimodal and 35% were quad modal. In the research study done by Slater et al, among the multimodal females, bimodal was 33.3%, Trimodal was at 26.7% and quad modal was at 40% among females. Among the males, bi, tri and quad modal were at 13%, 30.4% and

56.5% respectively. This meant that a large percentage of men were quadmodal[5]. Whereas in our research study, the highest number of multimodal males were bimodal and among females it was shared to same extent by bimodal, Trimodal and quad modals.

Most classes are conducted in lecture format at our institute. The advantage of a traditional lecture format is that large volumes of information are passed to the student in a relatively short time compared to other methods. Replacement of this format with active learning strategies would help students learn better. This research project found no differences between the male and female students. However most of the students of either gender had multimodal preferences especially including the kinesthetic component. Designing lab experiments which apply basic principles of physiology or to understand certain concepts, would help students learn the topic better as they would use the kinesthetic modality to learn and assimilate new information.

Strength of the study: The VARK instrument 7.8 has been validated and is accurate as given in their website [11, 12].

Limitations of this study: This research study was a single centre study with students coming from different parts of India with multicultural background and varied socioeconomic status. One confounding factor could have been the varied socioeconomic status, which we could not control for.

CONCLUSION

There were no differences between male and female students with respect to learning style differences. Multimodal preferences were seen in both males and females. Of the unimodal preferences, most females had kinesthetic preference and same was found in males.

Conflict of Interest -Nil

Source of Funding- Self

Ethical Clearance – Obtained

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Study of Pattern Reversal Visual Evoked Potentials in Newly Diagnosed IDDM Patients in North India

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ABSTRACT

Objectives: The present study was carried out to assess visual evoked potentials abnormalities in visual function exist in newly-diagnosed IDDM patients.

Method: Pattern reversal visual evoked potentials were recorded on evoked potentials recorder in 18 newly-diagnosed IDDM patients (age: 21.3 ± 3.2 years; duration of disease: 6 ± 2.6 months), and in 18 age matched control subjects.

Results: In comparison with control subjects, newly diagnosed IDDM patients showed: VEP P100 latencies significantly delayed ($P<0.05$) but amplitudes were not changed significantly.

Conclusions: VEP measurement seems non-invasive and highly sensitive method for detecting early involvement and changes in optic pathways in diabetics.

Keywords: *Pattern Reversal Visual Evoked Potentials (PSVEP) , P100 latencies , P100 amplitude, IDDM.*

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder which is characterised by hyperglycaemia resulting from defects in insulin secretion, insulin action or both. The long-term specific effects of DM include the development of retinopathy, nephropathy and neuropathy. Cardiac disease, peripheral arterial and cerebrovascular disease are also known to be linked with DM. Type 1 diabetes mellitus (IDDM) accounts for approximately 10% of all individuals with DM, and insulin therapy is the only available treatment. Type 2 diabetes mellitus (NIDDM) accounts for 90% of all individuals with DM. Diet, exercise, oral hypoglycaemic agents and occasionally exogenous insulin are used to manage NIDDM.

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Diabetes mellitus is one of the most frequent endocrine disease, is characterized by metabolic abnormalities and long-term complications that affect various organs and systems.

Diabetes mellitus (DM) is a global health problem. It is estimated that by 2030, diabetes will affect about 366 million people [1].

Hyperglycemia which, if untreated, is associated with significant risk of microvascular disease, and in particular diabetic retinopathy[2]. Nervous system involvement in diabetes has been amply documented. Important detectable changes in the higher functions appear to occur frequently in diabetics than commonly believed.[3]

Pattern-reversal visual evoked potential (PVEP) testing is an objective means of evaluating impulse conduction along the central nervous pathways. Increased peak time of the visual P100 waveform is an expression of structural damage at the level of myelinated optic nerve fibers.

The aim of this study was to firstly observe pattern-reversal visual evoked potentials (PVEPs) abnormalities in newly diagnosed IDDM patients. Secondly, to assess whether the central nervous system (CNS) and in particular visual function is affected by IDDM.

MATERIAL & METHOD

The present study involved 18 newly diagnosed IDDM patients of age (21.3 ± 3.2) years and duration of disease (6 ± 2.6 months) as cases and 18 age matched healthy volunteers as controls. The study was approved by the Institutional Ethical Committee. All the study subjects were investigated to rule out any other medical, neurological and ophthalmic problems that could affect VEP findings. The study subjects were instructed not to take any medication likely to influence VEP findings.

Exclusion Criteria:

1. Patients with history of any cardiac diseases, renal diseases, disease involving liver and respiratory system, hypertensive patients, patients with significant anemia (as per WHO criteria), electrolyte imbalance or resting abnormal ECG were excluded from the study.

2. Patients with any ophthalmological abnormalities like retinopathy, glaucoma or cataract, or visual acuity <6/18 with corrective lenses were excluded.

3. Duration of IDDM more than 1 year.

Before the test, complete procedure of the test was explained to the subjects and their informed written consent was taken. All the study subjects underwent a standardized protocol comprising of complete history, clinical examination including ophthalmic examination and other necessary investigations following which they were subjected to visual evoked potential (VEP) testing using RMS EMG EP MK-II machine equipped with pattern-shift stimulator monitor screen, signal amplifier with filters and a computer software system for averaging. VEP waves were recorded and analyzed.

Instructions to the subjects before the test:

- Thoroughly wash **hair** and asked not to apply any hair chemicals, lotions or oils.
- Subjects were instructed to ensure adequate **sleep** in the night before the test date.
- To bring the corrective lenses, if worn.
- Not to take any medications without consulting.

VEP was performed in a dark, quiet room specially equipped for electro-diagnostic procedure. Subjects were made to relax and sit comfortably in front of a video monitor displaying black and white checkerboard pattern at approximately 100 cm distance from the pattern-shift monitor screen. The subjects were asked to focus their gaze onto the red spot at the center of the screen. Each eye was tested separately (monocular testing). The checker pattern changed at a rate of approximately twice per second. Every time the pattern alternates, the visual system generates an electrical response that is detected and recorded by surface electrodes, placed on the scalp overlying the occipital and parietal regions as follows:

Surface electrodes were fixed with adhesive electrolyte paste as follows: active electrode at Oz (which is highest point on the occiput), with reference electrodes on the midline of frontal region (Fz) or 12 cm above the inion, ground electrode was placed at the vertex(Cz) (Fig-1). The bioelectric signal were filtered (band-pass, 1-100 Hz), and 150 events were averaged for every trial.

The visual stimuli were generated on a video monitor in form of checkerboard patterns (contrast 70%, mean luminance 50 cd/m2) that reversed in contrast at the rate of two reversals per second**.** The check edges subtend a visual angle of 15 minutes at the viewing distance of 100 cm, with video monitor screen subtending an angle of 12.5°. The refractive errors of all subjects were corrected for this viewing distance.

RESULTS

All the data were presented as mean values with standard deviation (SD) for descriptive results. Comparisons were made between groups by unpaired 't' test. Statistical significance was set on $p < 0.05$.

PRVEP was recorded in the IDDM patients as well as the control group and P100 latencies and P100 amplitude differences were analysed. [Table-1].

We found statistically significant prolongation of P_{100} latencies in newly diagnosed patients than controls (Table-1) i.e.101±5.62 Vs 97.16±4.11, $p<0.05$ and there was not significant change in P_{100} amplitudes values.

(5.42±1.43 Vs 5.88±2.05, P=0.44).

Table-1: **Mean P100 latencies and amplitudes in newly diagnosed IDDM and controls.**

Subjects	No. of subjects	Mean P100 Latency (Mean ± S.D.)	Mean P100 Amplitude (Mean ± S.D.)
IDDM	18	101±5.62	5.42±1.43
Controls	18	97.16±4.11	5.88±2.05
p- Value	---	0.02	0.44

DISCUSSION

The P100 is a prominent and more stable wave. It shows little variations between the subjects, minimal within-subject interocular difference, and minimal variation with repeated measurements over time[4]. Therefore, this paper focused more on the correlation P100 latency values among the groups which were examined.

In current study, The mean P_{100} latencies in newly diagnosed IDDM patients were significantly prolonged compared to controls (Table-1) i.e. 101±5.62 Vs 97.16±4.11, p value - 0.02 ($p<0.05$).

Previous findings shown that prolonged latencies, particularly P100, could occur and be registered very early in patients with DM1 [5,6].

The above findings are in accordance with Sima et al.[5], Karlica et al.[6], Yaltkaya K et al.[7]

The mean value of amplitude of P100 among cases was 5.42±1.43 and that of controls was 5.88±2.05.There was no significant difference in the amplitudes of P100 among cases and controls (p=0.44). [Tables 1]

Chronic exposure to high blood glucose levels is strongly correlated with peripheral nerve lesion severity[8,9]. Hyperglycemia leads to some metabolic changes that are extremely harmful for nerve fibers: increased polyol pathway activity, upregulation of advanced glycation end products (AGEs), and increased oxidative stress. Excess glucose in nerve cells is diverted via polyol pathway, where the formation of sorbitol and fructose will reduce the level of myo-inositol and decrease 4 Na+ /K+ ATPase activity, with secondary impairement of axonal transport and peripheral nerve structure [10-12].

Thus, the delay of P100 latencies in IDDM patients in the current study could be a manifestation of structural damage at the level of the myelinated optic nerve fibers or retinal ganglion cell damage before the development of diabetic retinopathy.

CONCLUSION

We therefore conclude that VEP is a useful tool in detecting early dysfunction due to retinal ganglion cell damage in IDDM patients before signs of diabetic retinopathy are actually detected in the patients. The present study has shown that P100 latency was significantly prolonged in IDDM patients. So VEP as a non-invasive, reliable and highly sensitive test to detect early neuronal changes in the pre-retinopathy stage in IDDM patients. Thus, VEP can be recommended as an early investigation in IDDM patients before the occurrence of retinopathy to monitor the early effects of diabetes on visual function.

Conflict of Interest: Nil

Funding: None

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A Study on Profile of Dietary Status, BMI and Physical Activity in Patients with Type 2 Diabetes Mellitus

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ABSTRACT

Introduction: Diabetes is a life-long illness with no proven cures and demands only management. Apart from conventional treatment, life style modification including diet and exercise has been accepted as cornerstone of treatment as it helps to maintain euglycemic levels and hence reduce the associated complications. This study has been designed to assess BMI, dietary status and physical activity in diabetic patients.

Materials & method: 300 patients with diagnosed type 2 diabetes mellitus (T2DM) without any complications were selected. BMI (kg/m^2) was calculated. Dietary intake was determined by dietary recall. Physical Activity profile was studied using standardized questionnaire.

Results: 65% of the subjects had high BMI. 68% had sedentary lifestyle. 35% of the subjects were consuming excess caloriesExcess calories intake was present in 61% of subjects in high BMI group. Sedentary lifestyle was observed in 73.3% of the subjects having high BMI and 89.6% of the subjects taking excess calories.

Conclusion: Sedentary lifestyle and high BMI were more commonly observed in the diabetic patients studied. Awareness regarding lifestyle modification with respect to diet, physical activity and weight control should be created among diabetic patients.

Keywords*: Diabetes Mellitus, BMI, Dietary status, Physical activity,*

INTRODUCTION

Diabetes, a major non-communicable disorder, is a life-long illness with no proven cures and demands only management. India leads the world in diabetes prevalence with 61.3 million diabetics estimated to rise to 101.2 million by 2030 [1]

This increased prevalence of T2DM is attributed to increased prevalence of obesity and lifestyle changes. High proportion of body fat is associated with insulin resistance. People in South Asia tend to develop diabetes with a lesser degree of obesity at younger ages and suffer longer with complications of diabetes due to ethnic susceptibility. Moreover, rapid economic developments have improved the availability of nutrients, specifically an energy dense diet predisposing people to both obesity and T2DM. [2]

The increased prevalence of impaired glucose tolerance and diabetes in urban India has been documented. Rural sector is catching up with the urban trends due to rapid industrialization and urbanization. [3,4]

In addition to conventional treatment, life style modification including diet and physical exercise has been accepted as cornerstone of treatment for diabetic patients as it helps to maintain euglycemic levels and reduce associated complications.

Rural population is generally unaware about the importance of diet and physical activity in control of DM. There is a need to evaluate the dietary pattern of these diabetic patients in order to provide appropriate information to plan a proper diet which includes locally

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available food items in right proportions. This study has been designed to assess BMI, dietary status and physical activity profile in diabetic patients, so as to implement the necessary dietary and exercise interventions to control DM.

OBJECTIVES

1. To calculate BMI to determine obesity in patients with T2DM.

2. To assess their dietary status using dietary recall.

3. To determine their physical activity profile using standard questionnaire.

MATERIALS AND METHOD

300 subjects with diagnosed T2DM and >30 years age of both genders were recruited after taking written informed consent. Ethical clearance was obtained from the Institutional Ethical Committee. Subjects with complications of T2DM or with H/O diagnosed tuberculosis, congestive cardiac failure and carcinoma were excluded. Systematic random sampling was done for collection of samples by recruiting every alternate patient attending OPD.

BMI was calculated by the Quitelet's formula: weight/height^2 (kg/m^2) and subjects were classified under low, normal and high BMI groups according to South Asian Standards.[5]

Dietary intake was determined by dietary recall. Total calorie and protein intake were estimated after noting the recommended daily allowance for that age.[6] Nutritive Value of different food items were calculated using Dietary Guidelines Manual, National Institute of Nutrition, Hyderabad.[7]

Physical Activity profile was studied using standardized questionnaire and average duration of the activity per day was calculated.[8] Physical Activity Level is a composite index of physical activity and is given by the formula: 24-hour energy expenditure/basal metabolic rate. 24-hours' energy expenditure is calculated as sum of energy expenditures of all reported activities for a single day. BMR/min was calculated first and MET (Metabolic equivalent) of that activity was applied as a multiple of BMR. 24 hour Energy expenditure= MET*Average duration of activity per day (min/day)*Basal metabolic rate. Residual energy expenditure relates to those periods of a day which are unaccountable by recall and a uniform MET of 1.4 was employed for all residual time.[8] BMR was calculated from regression equations recommended by WHO.[9] Physical activity Level values: Sedentary (< 1.4),moderate physical activity (1.4 – 1.75) and heavy physical activity (>1.75).

RESULTS

Mean age of the study group was 57.3 $\pm$ 10.81 years. General characteristics of the study population are shown in table 1.

Low BMI was reported in 6% of the subjects, 29% had normal BMI and 65% high BMI. With regard to the dietary status, 35% subjects consumed excess calories whereas regarding protein, 83% were deficient in daily protein intake.(Table 1).

Excess calories intake was present in 61% of subjects in high BMI group while it was 18.3% in normal BMI group and none in low BMI group. 73% of the subjects were consuming vegetarian diet. Food items with highest daily consumption were white rice, ragi and wheat. Most of the subjects (32%) consume a mixture of cereals. While 24% consumed rice and ragi, 11.3% only ragi, 11% ragi and wheat, 7.6% only white rice and none had only wheat. Only 9% were consuming pulses. 42.3% were consuming milk products. Egg was consumed by 7.6% of subjects. Vegetables, a good source of dietary fibers were consumed by 30.6% of the subjects.

Mean BMI of subjects taking excess calories intake was significantly higher than calories deficient(Table 2). Mean BMI of subjects consuming higher protein intake was also higher than protein deficient. (Table 3).

As far as physical activity level was concerned, 68% subjects were having sedentary lifestyle, 16.3% were moderately active and 15.7% were doing heavy physical activity. Sedentary lifestyle was observed in 73.3% of the subjects having high BMI. 89.6% of the subjects taking excess calories were having sedentary lifestyle.

Mean BMI was significantly more in subjects with sedentary lifestyle in contrast to subjects having moderate and heavy activity.(Table 4)

DISCUSSION

This study presented descriptive data from diabetic subjects. Obesity was prevalent in 65% of the diabetics. These results are comparable to other studies. Higher prevalence of obesity in diabetics was observed in 58.1% of subjects in Chennai, 83% in Gujarat, 78% in South Africa and 86% of in UK. [10,11,12,13]

The higher prevalence of obesity may be due to various factors of which diet and sedentary lifestyle being most important. In relation to obesity, 61% subjects in high BMI group were having high calorie diet making dietary calories an important cause of obesity in diabetes. Only 35% of diabetics consumed excess calories but 65% had high BMI. This discrepancy may be due to under reporting. The problem of under reporting in nutritional research has been reported earlier and it is said to be particularly common among obese. [14]

Regarding diet, it is not only the quantity of food intake but also the quality of food item which is important. High intake of foods with a high glycemic index (GI) and glycemic load (GL) increases risk of T2DM. Foods with higher GI and GL cause rapid post-prandial increase in blood glucose resulting in hyperglycemic state. [15]

South Indian population is rice-eating and eats preparations made from rice throughout the day. But in Karnataka and in our study, diet does not solely contain rice; it also constitutes ragi and wheat. 75% subjects had rice in their diet. Rice has been a staple food in Asian populations for many years, the transition to more refined white rice has rendered Asian populations more susceptible to the adverse effects of high intakes of white rice. Higher white rice intake is associated with a significantly elevated risk of T2DM, especially among Asians due to high GI and low fiber in white rice.[15,16] The deleterious effects of refined grains (predominantly white rice) and its strong association with T2DM and also with metabolic syndrome were evident from CURES Study. [17]

As far as Ragi is concerned, 81% of subjects consumed ragi daily. Though it has high dietary fibre content and dietary fibre is known to exert an inhibitory effect on the starch digestibility but it elicits glycaemic response equivalent to glucose load.[18,19,20] So, the usefulness of ragi as diabetic diet is questionable. According to American Journal of Clinical Nutrition, ragi has high glycemic index and load which is even higher than rice.[21] But according to Association of Food Scientists & Technologists (India) ragi contains phenolics that inhibit Malt amylase, α glucosidase, pancreatic amylase reducing postprandial hyperglycemia by partially inhibiting the enzymatic hydrolysis of complex carbohydrates.[22] But to date there are no long term intervention trials to bring to light the health benefits of ragi consumption.[23]

Only 57% of subjects consumed wheat in their diet and none of them were purely consuming wheat. Wheat has a low glycemic index compared to rice and ragi and also contains high dietary fiber. In addition to fiber wheat also contains resistant starch which has glycemic index lowering capacity and hence helps to manage T2DM.[24]

In NUDS study, prevalence rates of diabetes was higher in three southern cities (Hyderabad, Chennai and Bengaluru) where rice is staple diet, compared to three northern cities (Delhi, Kolkata and Mumbai) where it is wheat.[25]

Regarding protein more than 80% of the subjects were protein deficient. Majority i.e. 73% of the subjects were vegetarian, among them only 9% were consuming pulses. Although around 40% were consuming milk products but it was in the form of either butter milk. Only 30% of the subjects consumed vegetables which are good source of fibres and micronutrients.

An increase in protein content, particularly if associated with a decrease in carbohydrate would result in a decrease in the integrated glucose concentration. Such diet is useful for controlling blood glucose in T2DM. [26]

Another important factor responsible for obesity was sedentary lifestyle in most subjects. Similar results were revealed from other studies. Sedentary lifestyle was observed in 84% of subjects in Gujarat, 47.5% in Chandigarh, 17% in Chennai and 33.3% in Malaysia.[11,14,27,28]

In our study, in high BMI group, sedentary activity was observed in around 73% of the subjects making it an important contributing factor for obesity. In excess calories group, around 90% were sedentary. Overall, around 30% of the subjects had high BMI, excess calories and sedentary lifestyle.

As a consequence of urbanization, there has been an increase in the standard of living leading to a nutritional transition with consumption of diet which is energy dense and high in fat and sugar component. Moreover, with changes in occupation from predominantly agriculture based manual labour jobs to sedentary office type; there is an immense decrease in physical activity. This is the basis for the rapid weight gain and obesity seen in India.

Type & quantity of diet and exercise form a solid foundation for the prevention and treatment of T2DM. Regular physical activity increases insulin sensitivity, lowers blood sugar, reduces body fat, builds muscle and improves cardiovascular fitness.

Table 1: Characteristics of study population

PARAMETERS			
Gender	Males (68%)	Females (32%)	
BMI (kg/m²)	Low (6%)	Normal (29%)	High (65%)
Physical activity	Sedentary (68%)	Moderate (16.3%)	Heavy (15.7%)
Diet			
Calories	Excess (35%)	Deficiency (65%)	
Protein	Excess (17%)	Deficiency (83%)	

Table 2: Independent t test comparing BMI with calories intake

	Calories	**N**	**Mean±SD**	**p-value**
BMI	Excess	135	27.61 ±4.17	<0.01
	Deficient	165	23.21 ±4.24	

Table 3: Independent t test comparing BMI with protein intake

	Protein	**N**	**Mean±SD**	**p value**
BMI	Excess	51	27.72 ± 4.65	<0.01
	Deficiency	247	24.58 ± 4.34	

TABLE 4: ANOVA results comparing BMI with physical activity

	Sedentary activity	**Moderate activity**	**Heavy activity**	**ANOVA (F value)**	**Post Hoc (Bonferroni)** (p value)
BMI (mean ±SD)	25.81 ±4.75	24 ±3.47	23.08 ±3.9	8.925 p <0.001	Sed vs mod: p=0.033 Sed vs heavy: p<0.01 Mod vs heavy: p=ns

CONCLUSION

Obesity was prevalent among diabetics establishing it a major risk factor for T2DM. Majority of them had sedentary lifestyle. Excess calorie intake was observed in those with high BMI and sedentary lifestyle. Most of them were consuming a protein deficient diet.

Majority of the subjects were consuming a mixture of cereals, white rice and ragi being most important among them. White rice has high glycemic index and low fiber whereas ragi's benefit in diabetes is to be proved. Emphasis should be placed on improving intake of protein rich foods and whole grain cereals like wheat with a low glycemic index rather than refined grains. Awareness regarding lifestyle modification with respect to diet, physical activity and weight control should be

created among diabetic patients.

Conflict of Interests: None

Funding: Self

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The Relationship of Vital Capacity between Male & Female Elderly Indian Population

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ABSTRACT

The purpose of this study was to find out the relationship of vital capacity between in male & female elderly Indian population. "The cardiorespiratory function tests" was conducted on a randomly selected 110 apparently healthy subjects of 60 years and above age group belonging to both the sexes at Agra. Out of these 110 subjects, 84 were male and 26 females. In elderly Male (60+) the average vital capacity (V.C) was 2334.3 ± 370.3 ml and in elderly women (60+) 2206.2 ± 297.5 ml. The vital capacity shows a declining pattern with age in all age groups in men as well as in women and the relationship is statistically significant in both the sexes ($p < 0.01$ in men as well as in women).

Keyword: - *Spirometer, Vital Capacity, male and female, elderly Population*

INTRODUCTION

We are entering the 21st Century with the W.H.O. The concept "Health for All by 2000 A.D", but the older population is still ignored. Ageing is a universal process. In the words of SENECA[1] old age is an incurable disease

Sir James Sterling Ross[1]commented:"You do not heel old age, you protect it, you promote it, you extend it".

In a developing country like ours, older age groups are of special interest, particularly from a social and economical point of view. There is no escape from the fact that we are becoming a nation of elders.

UNESCO[2]estimates that the number of the aged above 60 is likely to go up from 350 million in 1975 to 590 million in 2005. About half of them are in the developing countries. In India out of the total population of 685,184,692 (Census, 1981) the aged i.e., above 60 yrs from about 6.3%. In fact,statistics in respect of the aged in India have been increasing constantly. In 1901 as the Census reveals, there were about 12 million people above the age of 60 years. In the next 50 years, i.e., in 1951, the population of the aged was 20 million. In the next 30 years from 1951 to 1981, the population of the aged rose to 43 million. Now the population of the aged is about 48 millions. It is expected that their population will67 million by the turn of this Century.

The founders of experimental physiology are Eras stratus (280 B.C)[3]and Galen (280 3.C)[4] who between them demonstrated the role of the diaphragm as a muscle of respiration, the origin and function of the phrenic nerve and function of the intercostals and accessory muscles. The function of the diaphragm was further explored by Da Vinci (1452-1519)[5] who observed that during inspiration the lung expands in all directions following the movement of the thoracic cage. The collapse which follows puncture of the pleura was described by Vesalius (1514 - 1564).[6]

The need for fresh air was recognized by Galen (280 B.C) [4] who believed it reacted with the blood, in the left heart and arteries to produce the 'vital spirit1. The absence of a visible communication between the pulmonary artery and pulmonary vein led him to suggest that blood passed through invisible pores between the two sides of the heart. He, therefore, failed to appreciate the true functions of the lungs.

Danders (1849)[7] demonstrated the role of elastic recoil of the lungs causing expiration, was the first to measure the retractive force. The work was extended by Cloetta (1913)[8]. Peabody (1915)[9] gave an idea of the relationship of vital capacity to breathlessness. The

term Forced Vital Capacity was used first time by Strohl (1919)[10]. Roher (1915)[11] tried to explain the relationship between the force exerted by the respiratory muscles and the rate of air flow on the basis of Newton's law. This work was further extended by Neergaard and Wirz (1927)using the pneumatochrograph of Fleisch. Neergaardin the same year (1927) also demonstrated the roleof surface forces in the lung by comparing the relationship of lung volume to retractive force when the air in the lung was replaced by water.

Jansen, Knipping and Stromberger (1932)[12] calculated the equivalent minute volume frookyaograph records of a forced vital capacity and introduced the term maximal breathing capacity as one of the lung function test. The measurement of maximal breathing capacity was made first time in 1933 by Hermannsen. Christie (1934) demonstrated the role of change in lung distensibility in causing breathlessness.

Bhargava et al. (1973)[13] in their study in Bhopal reported the low vital capacity in female subjects as compared to male subjects of same age group (56 - 65 yrs). They reported theV.C. 2260 ± 82 ml in men and 1875 ±165 ml in women.

Damoder et al. (1983)[14] also reported the decreased ventilatory function in smokers as compared to non-smokers and reported that all the indices decreased with age

Meenakshi (1984)[15] in her study "Spirometric data in South Indian subjects 60-80 years" also reported a declining trend of vital capacity with age. She reported the lower value of vital capacity in female as compared to male subjects of the same age group.

J. Pathak and P.P. Mehrotra et al. (1989)[16] in their study "Pulmonary Functions of Elderly Indian Subjects" concluded a decreasing pattern of V.C. with age but the decline is not uniform.

Anderson et al. (1978)[17] in their WHO publication quoted that Framingham longitudinal studies indicated that high physical performance capacity i.e., a strong hand grip, high vital capacity and a low resting heart rate, are associated with a lower than average incidence and severity of cardiovascular pathology.

MATERIAL AND METHOD

The present study "The Cardiorespiratory Function Tests" was conducted on a randomly selected 110 apparently healthy subjects of 60 years and above age group belonging to both the sexes at Agra. The survey v/as conducted under the joint auspices of Department of Physiology and Department of Cardiology, S.N. Medical College, at Agra.

The following Cardiorespiratory function tests were carried out on these subjects

Vital Capacity in ml

Methods for Recording :-

Vital Capacity : It is defined as maximum volume of air that a person can forcefully expire with maximum expiratory efforts after taking deepest possible inspiration. It is expressed in terms of litres

Procedure :

The instrument used was Spirometer. Before starting the test, procedure was well demonstrated to the subject. The pointer was adjusted to zero level. The subject was asked to take the mouth piece in the grip of his mouth. Now the subject was instructed to take a deepest possible inspiration in order to fill the lungs with air to the maximum extent. The nose was closed with nose clip and then exhaled out the air with maximum expiratory efforts through mouth piece. Three readings were taken at the interval of five minutes. Highest of three was taken as final reading for the study.

Precautions:-

The following precautions were taken to obtain the best results:-

The subject was explained the detailed procedure.

The subject was taken in full confidence before starting the test,

The Spirometer was thoroughly checked for any zero error,

Measures were taken to avoid any leaks through nose or from around the mouth piece.

Resistance and inertia of the instrument should be minimum. The air passage should be wide (more than 3.2 cm).

Before taking reading the subjects were given

preliminary training/practice attempts to attain the best of their ability.

OBSERVATIONS

In the present study "Assessment of Cardio-respiratory function tests in Indian Population of 60 years and above Age Group", 110 subjects belonging to both sexes were studied. Out of these 110 subjects, 84 were male and 26 females. The details of these findings in various age groups and different sexes are shown in Tables

Following cardio-respiratory function tests were performed on these subjects:-

Vital capacity (V.C) in ml.

For the sake of convenience the subjects were grouped in male and female subgroups. Each subgroup was further divided in four subgroups as follows:-

Group I	: 60 yrs to 64 yrs
Group II	: ↓65 yrs to 69 yrs
Group III	: ↓70 yrs to 74 yrs
Group IV	: ↓75 yrs and above.

For each group the mean age was calculated as shown in Table 2.

A predesigned Performa (From WHO Publication European Series No.6) appended herewith was filled up in order to obtain a detailed personal history, medical history and other information regarding each subject.

The mean values and standard deviation of all the parameters with respect to age group, comparative evaluation of these parameters in corresponding age group of male and female subjects were calculated and the findings are tabulated, Finally, the statistical correlation in form of r, t and p values of each parameter was calculated as shown in each table.

DISCUSSION

Ageing is a progressive failure of body's homeostatic adaptive response resulting in increased vulnerability to environmental stress and disease. The physiological sign of ageing are gradual deterioration in function and capacity to respond to environmental stress. Ageing is a general physiological on-going process and despite intensive research the mechanisms of ageing are still to be explored. Even though the mechanism of ageing will probably be attributed to a number of different regulatory mechanisms; such as cellular or molecular function, the study of system-integration should remain an important topic in the scientific investigation of ageing (Shock, 1977)[18]. The performance of most human physiological functioning is dependent on the co-ordinated efforts of several organ systems.

Shock (1979)[18] demonstrated greater ageing decrements in the performance of integration system than in the separate variables themselves. One of the most rapidly declining and perhaps most devastating decrement in ageing is the declining functional ability of cardiorespiratory system.

The present study of evaluation of cardio-respiratory functional ability in elderly age group was conducted with the objective to determine the effect of ageing on these functional abilities and also to compare and observed, were carried out and studied in relation to various age groups in both the sexes.

Pathak and Mehrotra et al. (1989)[16] in their study "Pulmonary Functions of Elderly Indian Subjects" concluded a declining pattern of vital capacity with age but the decline was not uniform.

Table - 1: Comparative evaluation of vital capacity of total number of male and female subjects studied (n= 110)

Sex	No.	Vital Capacity in ml	
		Mean	S.D
Male	84	2334.30	± 370. 30
Female	26	2206.20	± 297.50

t = 7.1103 P <0.01

Table - 2: Comparative evaluation of vital capacity of different age groups in male and female subjects studied (n = 110)

Age Groups (Years)	No.	Male		No.	Female	
		Mean	S.D.		Mean	S.D.
60 – 64	26	2559.0	± 368.5	11	2339.0	± 293.3
↓65-69	20	2396.5	± 321.9	8	2150.0	± 222.40
↓70-74	17	2340.0	± 254.1	4	2045.0	± 235.5
↓75+	21	1990.4	± 210.2	3	1843.3	± 175.9

RESULT

In elderly (60+) men the average vital capacity (V.C) was 2334.3 ± 370.3 ml and in elderly women (60+) 2206.2 ± 297.5 ml. The vital capacity shows a declining pattern with age in all age groups in men as well as in women and the relationship is statistically significant in both the sexes ($p < 0.01$ in men as well as in women) showing table no.1.

Ethical Clearance:-Yes

Source of Funding :-Self

Conflict of Intrest:- None

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Effect of Head Up Tilt on Cardiovascular Autonomic Responses in Females

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ABSTRACT

Orthostatic stress is commonly utilized to evaluate the cardiovascular autonomic function. This is done mainly by Head Up Tilt (HUT) testing. The parameters which represent the cardiovascular autonomic function involved the Heart Rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean Arterial Pressure (MAP) and Pulse Pressure (PP).

Method: Hundred apparently healthy females in the age group of 18-45 years were selected to evaluate the effect of HUT on cardiovascular autonomic responses. Parameters like HR and BP were recorded at supine, 30^0, 60^0 and 80^0HUT.In each position the HR was determined by recording the ECG for 5 min in lead II.Niviquire software was used.BP was measured within 20 seconds of the change in tilt position.

Results: HR, DBP, MAP increased on HUT in females. SBP and PP decreased on HUT.

Interpretation and conclusion: During HUT there is increase in sympathetic activity (increase in HR, DBP) Postural stress test is useful for medical students, physiologists and clinicians to understand cardiovascular reflex response in healthy or diseased individuals.

Keywords: *Autonomic nervous system; Posture.*

INTRODUCTION

Baroreflexes are an important mechanism by which the central nervous system controls blood pressure in response to acute challenges imposed by change in posture. There is debate as to whether or not gender differences exist in sympathetic reflex responses. [1] Most reports indicate that susceptibility for orthostatic intolerance is more common in women than in men.[2]

Imbalance between sympathetic activation of heart and the vasculature has been described in heart failure patients and postural tachycardia patients. There are many factors which will influence the baroreflex function. Variation in blood pressure with age and gender has also been reported. The postural hypotension is the most disabling feature of autonomic dysfunction. The autonomic function tests are helpful when the history and physical examination findings are inconclusive.[3]Tilt table test is a standardized, physiological, clinically relevant stimulus that challenges the cardiovascular regulation. By the performance of head up tilt, it is possible to assess the dynamic capacity of regulatory system. Human responses to upright tilt is a window on central autonomic integration.[4]

Light was thrown over the gender related differences in the baroreceptor reflex control of HR in normotensive humans. Average age and BP were similar in both sexes, but females had a significantly higher HR. A major difference existed between the two sexes when the BP was elevated by intravenous administration of phenylephrine. Females had a significantly smaller baroreflex sensitivity, which inferred a gender-related difference in baroreceptor reflex control of HR. However, a positive correlation existed between basal HR and baroreflexsensitivity. It was important to investigate whether this difference was related to the significantly lower basal HR in females.[5]

The effects of various degrees of tilt in normal control subjects was taken into consideration. This study suggested that a protocol of 60^0 or 70^0 tilt testing for not more than 10 min would provide a reasonable

specificity for assessing syncope. Even with 60^0 or 70^0 HUT for less than 10 min, 30% to 40% of patients with otherwise unexplained syncope had a negative HUT test response[6].

Six healthy subjects aged 30-58 years and 6 patients with orthostatic hypotension were chosen. Arterial pressure and HR were recorded. In healthy subjects HUT induced gradual circulatory adjustments. After 2 min upright, stroke volume and cardiac output had decreased by 39 % and 26 % respectively. Little change in mean BP at heart level indicated that systemic vascular resistance had increased by 39% and 24%. The gradual responses upon HUT contrasted with the pronounced and rapid circulatory responses upon tilt back. In the patients a progressive fall in BP on HUT was observed.[7]

Dynamics of circulatory adjustment to HUT and tilt back were explained in healthy and sympathetically denervated subjects. It was observed that in healthy humans upon HUT neural compensatory mechanisms became very effective in maintaining arterial pressure at heart level. The gradual circulatory adjustments to HUT in healthy subjects contrasted with the pronounced and abrupt circulatory changes on tilt-back. In patients with a lack of neural circulatory reflex adjustments, graded BP decreased on HUT and gradually increased to tilt back position.[8]

METHODOLOGY

100 female subjects between the age group of 15-45 years are selected from general population randomly. The subjects were informed about the procedure which had to be followed by them. Consent was taken. The study was conducted before lunch between 12 noon to 2 pm. After the completion of procedure fruit juice was offered to all subjects.

Inclusion Criteria:

- Normal healthy females aged 15-45 years

Exclusion Criteria:

- Obese
- Alcoholics
- Smokers
- Hypertensives
- Age below 15 and above 45 yrs
- Subjects taking any medication
- Subjects suffering from any medical illness.
- Women taking oral pills
- Menstruating women
- Diabetic individuals

Method of Collection of Data:

100 female subjects between the age group of 15 to 45 were selected randomly from general population. A pretested structured proforma was used to collect the relevant information. Subjects were familiarized with HUT procedure.

Preparation for Tilt Table Test (TTT) :

Generally, there was no eating or drinking 4-6 hours prior to the test to limit symptoms of nausea / vomiting. Manually operated tilt table with foot plate support is used. Additional straps are applied at the level of knee, waist and shoulders. The metal arc is attached to the table where holes are made at various angles. The table is locked at particular angles by the iron rod. The angles used were 30^0, 60^0, 80^0 for HUT.

ECG leads were fixed at right arm, left arm, left foot and right foot. ECG recordings were observed over the monitor. When normal lead II ECG was obtained, these recordings were saved for a duration of 5 minutes.

In supine position BP was recorded by using Sphygmomanometer. BP was recorded within 20 sec after the change in posture. Pulse rate is recorded by 5 min ECG. Respiratory rate was recorded for 1 minute. The table is tilted to 30degree, 60degree and 80degree HUT position. Before the change in the tilt angle the subject was brought to the supine position for 5 mins rest. The subject was asked for any symptoms such as nausea, sweatiness, pallor, light headedness, palpitation and fainting. Frequency domain analysis was done by using Niviqure software.

Repeated measures ANOVA will be used for analysis at different tilts. Followed by Tukeys post hoc test and paired ‘t’ test. Inter group comparisons will be done by unpaired ‘t’ test.

DISCUSSION

Orthostatic stress is commonly utilized to evaluate cardiovascular autonomic function. This typically involves the passive movement from a supine to head up tilt ,while cardiovascular parameters are measured. One of the most commonly used techniques for assumption of orthostatic stress is head up tilt. The most common tilt table testing protocol is one that incorporates an angle of 30^0, 60^0 and 80^0 head up tilting.[4]

In our study, heart rate increased linearly with increasing angle of head up tilt in females. The increase in heart rate was statistically significant ($p < 0.001$). The head up tilt reduces the intra-thoracic blood volume and shifts it in to the legs where it forms a pool, thereby producing a fall in blood pressure and a reduction in the circulating blood volume. Compensation to this is brought about by a reflex blood pressure and, venoconstriction which helps to limit the maintenance of the arterial pool in the legs, keeps up the pre-load, and is helped by the increased activity of the abdomino-thoracic respiratory pump, the pumping action of the leg muscles and the venous valves.During upright posture there is pooling of the blood in the lower parts of the body and low pressure in the carotid sinus. This removes stretch from baroreceptors leading to increase in heart rate through withdrawal of vagal tone initially followed by increased sympathetic activity which leads to sustained tachycardia. The initial heart rate was under vagal control with an immediate vagal withdrawal and increase in sympathetic activity. The increase in heart rate response to an upright posture was smaller in magnitude in women than in men. Similar findings were reported by many workers, Shanker Rao9, Johntuckman[10], David A Lewis [11]and M.B. Dikshit[12].

Posture and systolic blood pressure :

In the present study the mean systolic blood pressure decreased from supine to head up 30^0,60^0, and 80^0 position. On head up tilt the systolic blood pressure decreased on changing from recumbent to upright position on the tilt table. There is 20-30% shift of venous blood from the central to the peripheral compartment, 50% of change occurs within seconds and results in decreased cardiac filling pressure. The stroke volume is also decreased by 40%. This decreased afferent activity from the sensory baroreceptor and the heart rate rises are due to increasing sympathetic activity. The sympathetic vascular resistance and overall cardiac output drops by 20% only. The decrease in systolic blood pressure on head up tilt had a greater decrease in females than males. Similar findings were reported by Robert S[13], Maxime Lamarre[7], M.B. Dikshit[12], John Tuckman[10].

In our study there was increase in the diastolic blood pressure with increasing angle of head up tilt. The mean value showed a statistical significance ($p < 0.001$) On head up tilt there is increase in the sympathetic activity, increase in vascular tone and increase in peripheral resistance which leads to an increased diastolic blood pressure. Similar findings were reported by U.K. Mishra[8], Sabita Yograj[15], Tomi Lai Tinin[16], John Tuckman[10] and Zaidi[17], M.B. Dikshit[12], Mukai[18].

In our study the pulse pressure decreased on 30^0, 60^0 and 80^0 head up tilting in females. There was a significant decrease in the value ($p < 0.001$).

Pulse pressure is the difference between the systolic and the diastolic blood pressure. This is the pressure that maintains the normal pulsatile nature of the flow of blood in the vascular compartment. The pulsatile nature of the flow is required for the perfusion of the tissue.[19,20,21].

This decrease can be explained by the fact that, increase in diastolic blood pressure and decrease in systolic blood pressure, decreases the pulse pressure. Similar findings were reported by Jane Youde[22] and J. Kevin Shoemaker[5].

Mean arterial pressure and posture :

In the present study the mean arterial pressure increased on the upright posture in females. On head up tilt increase in the diastolic blood pressure and decrease in systolic pressure resulted an increase in the mean arterial pressure. The hydrostatic gradients with head up tilt reduce the distending pressure in carotid sinus resulting in a sympathoexcitatory stimulus. This reduction in carotid sinus distending pressure would partially be corrected by the increase in mean arterial pressure. Similar findings were also observed by Frey MA[3] .*The* mean arterial pressure increased more in males than in females at 60^0 head up tilt. Similar findings were also observed by J. Kevin Shoemaker[5].

This study concluded that with head up tilt there are changes in the cardiovascular parameters in females.

In conclusion, cardiovascular reflex effects can be

assessed using various postural stress tests effectively for physiological and clinical investigations in the field, by the patients bed side, or in the laboratory using more elaborate equipment. Physiologists, clinicians and medical students can make use of these tests to assess or understand cardiovascular reflex response in man in health or disease.

Parameters	Supine		30 Deg		60 Deg		80 Deg	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
HR (bts/min)	70.8	3.3	72.9	3.4	74.7	3.4	77.2	3.0
SBP(mm of Hg)	112.3	5.4	110.2	5.2	108.6	5.7	106.2	5.6
DBP(mm of Hg)	78.2	6.6	80.1	6.2	83.5	5.9	85.2	5.5
PP(mm of Hg)	34.5	7.0	30.0	6.8	25.0	7.7	21.0	6.8
MAP(mm of Hg)	89.1	9.8	89.9	5.0	91.7	4.6	92.2	4.4

Ethical Clearance- Taken from our college ethical clearance.committee

Source of Cunding- Self

Conflict of Interest- Nil

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Comparative Study of Visual Reaction Time in Males and Females of 17-20 Years Age Group

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ABSTRACT

Background: Human reaction time denotes time taken by an individual to react to an external stimulus. The response obtained while measuring human reaction time is voluntary response obtained after training and is specific in nature. The purpose of this study was to find out whether the reaction time was faster for green light stimuli or red light stimuli. And to compare the visual human reaction times in males and females.

Material & method: In this study we had studied the time taken between applications of visual stimulus and response obtained and comparison of the response in male and female volunteer. In this study visual reaction time (VRT) was studied in 125 male & 125 female Medical students in the age group of 17-20 years. Subjects were presented with two visual stimuli i.e. green light & red light stimuli. Paired and unpaired't' test was used at appropriate places as a statistical test. The p value <0.05 was considered significant.

Result: Human reaction times to green light stimuli were lesser than human reaction times to red light stimuli in males as well as in females.

Conclusion: Green color evoked a faster response due to its stronger stimulation on the visual receptor than for red color in both male and female subjects.

Keywords*: visual reaction time,green light,red light,male,female.*

INTRODUCTION

Reaction time is crucial for our everyday lives and requires intact sensory skills, cognitive processing and motor performance. Reaction time measurement is an indirect index of processing capability of central nervous system and simple means of determining sensory motor association and performance of an individual [(1)]. Reaction time has physiological significance and is a simple and non - invasive test for peripheral as well as central neural structures [(2)]. It determines the alertness of a person because how quickly a person responds to a stimulus depends on his reaction time and therefore it must be lesser in certain occupation e.g. Drivers, sportsmen, pilots, military people, doctors, nursing staff, security guards. Various factors influencing human reaction time are age, left or right-hand, direct (central) versus peripheral vision, practice, fatigue, fasting, breathing cycle, personality types, exercise, and intelligence of the subject. Out of these various factors, in this study we had studied the time taken between application of visual stimulus and response obtained and comparison of the response in male and female volunteer. The human reaction time measurement had been made from the volunteers subjected to visual stimulus.

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MATERIALS AND METHOD

Proper consent of volunteer students was taken (a) Inclusion Criteria: Students between 17-20 yrswere included in this study on the basis of physical

examination-normal sensory and motorexamination, students having no muscle diseases (i.e. Myasthenia gravis, periodic paralysis,polymyositis) and students having no neural diseases (i.e. poliomyelitis, polyneuropathy) were included in the test and Students having normal acuity of vision as tested by Snellen's test type and Jaeger's test type. Students having normal color perception as tested by Ischihara's chart.

(b) Exclusion Criteria: Students below 17 yrs and above 20 yrs age group, Students not having normal acuity of vision as tested by Snellen's test type and Jaeger's test type. Students not having normal color perception as tested by Ischihara's chart.

Students not having and students not having normal sensory and motor examination, and having muscular diseases and students having neural diseases were excluded from the test.

Study procedure

Study was carried out on the Medical students of Index Medical College Hospital & Research centre, Indore. 125 Male and 125 Female Medical students fulfilling inclusion criteria were included. The apparatus used in this study was Audio-Visual reaction timer. Proper consent of volunteer students was obtained before the procedure. Each individual wasexplained about the test & sufficient trials were givenfor proper understanding. All the subjects weresubjected to the tests in the dark room. The visual reaction time was noted during morning hours (10 am-12 pm).

i. The apparatus is designed to measure R. T. for 4 stimuli: Two sound stimuli and two light stimuli.

Two response alternatives are provided by two response keys. The chronoscope is built in to count the reaction time.

ii. Subjects were instructed to press the response button by the Rt. Index finger already on it to stop the clock as soon as he/she will see the green light/red light visual stimuli from digital display, reaction time was noted.

iii. Three readings of each stimulus taken & their respective average calculated.

A comparison were made between –

1. Visual reaction time to green light & red Light visual stimulus in males and females Separate.

2. Visual reaction time to green light & red light Visual stimulus between males and females.

Statistical analysis:

To test whether there was any significant difference in between males and females with reference to the study variables between the study groups, paired and unpaired 't' test was used at appropriate places as a statistical test. The p- value <0.05 was considered significant.

RESULTS

Visual human reaction time was studied in 250 medical students of Index Medical College Hospital & Research Centre, Indor who formed the study group and out of which 125 were male students, and 125 were

Female students. The range of age was from 17-20 years. The results were tabulated and statistically analyzed. To test whether there was any significant difference in between males and females with reference to the study variables between the study groups, paired 't'and unpaired' test was used at appropriate places as a statistical test.

From Table No. I

i. T he VRT to green light stimuli male was 192.77±9.92 and the VRT to Red light stimuli in male was 203.79±9.54. TheVRT to red light stimuli in male was more than the VRT to green light stimuli in male and the difference between two were found statistically significant in case of males (P = 0.000).

ii. The VRT to green light stimuli in female was 202.00±10.18 and the VRT to red light stimuli in female was 211.71±8.82. The VRT to red light stimuli in female was more than the VRT to green light stimuli in female and the difference between two were found statistically significant in case of female (P = 0.000).

iii. The VRT to green light stimuli in males was192.77±9.92 and the VRT to green light stimuli in females was 202.00±10.18. TheVRT to green light stimuli in female was more than the VRT to green light stimuli in male and the difference between two were found statistically significant in case of (P = 0.000).

iv. The VRT to red light stimuli in males was 203.79±9.54and the VRT to red light stimuli in females was 211.71±8.82. The VRT to red light stimuli in females

was more than the VRT to red light stimuli in males and the difference between two were found to be statistically significant (P = 0.000).

Table No. 1: Measurement of VRT to green light & red light in males & females.

	Sex	N	VRT (in milliseconds)	P value
Green Light	Male	125	192.77±9.92	0.00*
	Female	125	202.00±10.18	0.00*
Red Light	Male	125	203.79±9.54	0.00*
	Female	125	211.71±8.82	0.00*

(Data presented are mean ±SD,*p<0.05=significant, VRT=Visual reaction time)

DISCUSSION

In the present study, it has been observed that females had a longer reaction time when compared to males. Retention of water and sodium due to variation in sex steroid levels during menstrual cycles might influence the process of axonal conduction time and availability of neurotransmitter at the synaptic level; changes in either of these two processes might cause conduction time to vary during menstrual cycle [3, 4]. The literature is replete with reports of patients suffering from severe premenstrual fluid accumulation sometimes even up to 10pounds in weight gain. The degree of premenstrual weight gain is reported to correlate with degree of various premenstrual neurological symptomatologies in many cases. This may be the cause of prolongation of visual reaction time in the present study, since reaction time indicates the minimum time taken by an individual to react to an external stimulus and is an indirect index of processing capability of central nervous system and sensory motor association. Green color evoked a faster response due to its stronger stimulation on the visual receptor than for red color in both male and female subjects [5]. The corpuscular theory of light, proposed by Max Plank explains the relationship between the wavelength and the energy carried by different colored lights. It indicates that one quantum of red light has the maximum wavelength and hence carries the least energy. The green light of same quantum has shorter wavelength and carries greater energy than red light. The greater energy carried by green light could be an important factor in stimulating the visual receptors faster, when compared to red light, producing a shorter response time [5]. The maximum sensitivity of scoptopic vision is approximately 500 nm i.e. for bluish – green light. This shows that red color (650-750 nm) is not at all sensitive to dim light. Thus in dim light, if blue and red colors need to be compared, blue can be made out easily. Likewise maximum sensitivity of photopic vision is about 560 nm i.e., for greenish –yellow light. Thus, in conclusion, human reaction time in females is more as compared to males and reaction time to red light stimuli is more as compared to green light stimuli in both sexes.

Ethical Clearance: as this is non invasive method no ethical aspects involved, still permission taken from ethical committe of index medical college.

Funding: Self

Conflict of Interest: Nil

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Gender Differences and Anthropometric Variables in Prehypertensive Young Individuals

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ABSTRACT

Background & Aim: Prehypertension is a complex, multifaceted disease which is a risk factor for overt hypertension and increases the risk for coronary heart disease , stroke and other vascular complications. Lifestyle changes taking place with a stunning speed are favourable to the onset of prehypertension in young individuals itself. We aimed to assess the prevalence of prehypertension in young individuals and analyse the gender differences in the prevalence of prehypertension . The association of prehypertension with anthropometric parameters was also assessed. **Method:** In this cross-sectional study 250 males and 250 females were recruited from the College students of Coimbatore city. A detailed history was collected. Weight, height, waist circumference , hip circumference were recorded. From these parameters Body mass index and Waist Hip ratio were calculated. Blood pressure was recorded using a standardised mercury sphygmomanometer. **Results:** 15.6% of the study group were Prehypertensives. The prevalence of Prehypertension was more among males than females. Individuals with higher body mass index, waist circumference and waist hip ratio were at a greater risk of developing prehypertension. **Conclusion:** We conclude that by screening for and detecting prehypertension at an early age, patients can be advised regarding control of their blood pressure , change of lifestyle and prevention of progression to hypertension.

Keywords: *Prehypertension , Body mass index, Waist Hip ratio.*

INTRODUCTION

Non Communicable diseases like Cardiovascular diseases, cancers, diabetes, chronic respiratory diseases, and mental disorders now impose their greatest burden on low- and middle-income countries. Cardiovascular disease is one of the leading causes of death. Elevated arterial pressure is the commonest cardiovascular disorder posing a major public challenge to the population[1]. Patients with blood pressure above optimal levels (systolic BP 120 -139 mmHg and / or diastolic BP 80 – 89 mmHg), but not clinical hypertension are defined as having prehypertension[2]. Prevalence of prehypertension is showing an upward trend in most countries , that too in younger individuals . About 7% of those with prehypertension progress to develop hypertension per year. It increases the risk for coronary heart disease, stroke and other vascular complications. Studies targeting younger age group would provide an estimate of the future magnitude of the problem and assist in developing strategies for control of prehypertension.

Hence in this study we aimed to assess the prevalence of prehypertension in young individuals, to compare the prevalence of prehypertension in males and females and to study the association of prehypertension with body mass index, waist circumference and waist hip ratio.

MATERIALS AND METHOD

Ethical clearance was obtained from Institutional Ethical Committee. Participation in the test was voluntary and informed consent was obtained from all participants.

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This is a cross sectional comparative study. This study was conducted in the Department of Physiology, Coimbatore Medical College, Coimbatore. A total of 500 subjects were included in the study of which 250 were males and 250 were females. They were of 18 – 23 years age group. The study subjects were randomly selected from the students of Coimbatore Medical College. The study subjects of both the sexes were divided into two groups based on their sex. Each group was subdivided into two based on their BP into two subgroups as follows. **Group I_A –** Prehypertensive males , **Group I_B** – Normotensive males, **Group II_A –** Prehypertensive females , **Group II_B –** Normotensive females. Known hypertensives, Known cardiac patients, Acutely ill patients were excluded from the study.

A detailed history was recorded from the study subjects. Thorough clinical examination was done. The participants were instructed to wear light clothing during their study visit. During anthropometric measurements the participants were instructed to stand erect with abdomen relaxed, arms at their side and feet together. Weight (in kilograms) was recorded using standard weighing machine. Height (in centimeters) was measured in standing and erect posture using a stadiometer. Body Mass Index (in kg/m^2) was calculated as the ratio of weight and square of Height in meters, using Quetelet Index. Normal cutoff value for BMI is 23 kg/m^2 men and women in Asian adults[3]. Waist circumference (in centimeters) was measured at the narrowest circumference between the bottom of the rib cage and top of the iliac crest, following normal expiration. Normal values in females < 80 cm, males < 90 cm^3 .Hip circumference (in centimeters) was measured at the largest point between the iliac crest and the symphysis pubis. The ratio of measured waist and hip circumference was taken as the Waist Hip ratio of that individual. Normal values in females ≤ 0.81 , males ≤ 0.88[4].

A standardized mercury sphygmomanometer , stethoscope , BP cuff of appropriate size were used to measure the blood pressure. BP was recorded in the right arm in sitting posture after 5 minutes of rest. The first and fifth korotkoff sounds were recorded as systolic BP and diastolic BP. Three recordings of BP were taken on three consecutive days. Average of the three readings was taken as the blood pressure of the subject[5].

RESULTS

We compared the prevalence of prehypertension among Group I and Group II. Prevalence of prehypertension is 15.6% in the study group . It is higher in males compared to females. Prehypertensive males and females had significantly higher levels of body mass index, waist hip ratio and waist circumference compared to normotensive males and females respectively.

Figure – 1: Comparison of prevalence of Prehypertension in males and females

Table 1: Blood pressure in prehypertensive and normotensive males

Variable	Group I_A (n=49)	Group I_B (n=201)	P value
SBP	124.79 ± 6.00	108.72 ± 6.54	<0.0001*
DBP	80.02 ± 4.71	72.69± 4.40	<0.0001*

Table 2: Blood pressure in prehypertensive and normotensive females

Variable	Group I_A (n=29)	Group I_B (n=221)	P value
SBP	118.63± 6.95	103.5± 7.75	<0.0001*
DBP	80.48± 4.85	68.88± 5.00	<0.0001*

Table 3: Comparison of anthropometric parameters in prehypertensive and normotensive males

Variable	Group I_A (Mean±SD)	Group I_B (Mean±SD)	p value
BMI	23.05 ± 2.96	21.38 ± 2.2	0.022*
WHR	0.84± 0.05	0.82 ± 0.04	0.01*
WC	78.39 ± 8.89	74.59 ± 6.90	0.004*

Table 4: Comparison of anthropometric parameters in prehypertensive and normotensive females

Variable	Group II_A (Mean±SD)	Group II_B (Mean±SD)	p value
BMI	23.67± 3.10	21.28±2.69	0.0001*
WHR	0.77 ± 0.04	0.76± 0.03	0.001*
WC	75.45± 8.27	69.67±7.96	0.001*

DISCUSSION

Prevalence of prehypertension in the current study was 15.6%. The prevalence rates estimated range from 14.5% in Turkish adults[6], 32.3% in affluent North Indian population[7], 47 % in rural adult people in China[8] and 54.1% in Omani adults[8]. Prevalence of prehypertension was higher in males (19.6%) compared to females (11.6%). This finding of higher blood pressure in men compared to women have been reported in the other studies[7,8,9] .This appears to be due to the protective effect of estrogen. Estrogen has a direct effect on blood vessel endothelial cells resulting in immediate vasodilation mediated by estrogen receptors. It exerts an antiarteriosclerotic effect on blood vessels[10].

Those with prehypertension had increased body mass index and waist hip ratio compared to normotensives[7,11]. BMI is the strongest modifiable predictor of prehypertension[12]. Being overweight was associated with a definite higher risk of developing prehypertension[9,13]. Obesity is characterized by increase in total blood volume and cardiac output. Elevated cardiac output appears to be required to support the excessive metabolic needs of adipose tissue . This leads to elevated arterial pressure[5]. The long term effect of weight control has substantiated that weight reduction could lower the odds of hypertension by 77% , so losing weight is necessary for prehypertension people[14].

CONCLUSION

The current analysis suggests that 15.6% of the group is already at risk for future cardiovascular disease. As a large proportion of people with prehypertension progress to clinical hypertension, targeting these people with effective public health education and early life – style modification interventions aimed at healthy dietary habits , weight loss and increased physical activity can provide important long-term benefits . Conscientious counselling and patient education may forestall the need for pharmacologic measures intended to reduce coronary risk[5].

Conflict of Interest : Nil

Source of Funding : Self

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Comparison of Blood Pressure Readings, Recorded by Different Measuring Devices

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ABSTRACT

Aim- Aim of our study is to measure the BP by using all the three devices to find out the standard difference of BP between them. **Objectives-** Comparison of BP recordings, measured using mercury Sphygmomanometer, aneroid Sphygmomanometer and automated devices. **Material and method**- the study was conducted on normal healthy subjects between the age group of 18 to 25 years (MBBS and NURSING students) of Amala Medical sciences Kerala. We recorded the BP of all the healthy subjects using three different BP measuring devices (mercury, aneroid and automated BP apparatus) with gap of 5 minutes between the readings. **Statistical analysis**- independent "t" test was used for the analysis. **Results**-there was a significant difference ($p<0.0001$) among the SBPs and DBPs recorded by all the three devices except SBP of mercury and automated were the significant difference was less ($p<0.05$). **Conclusion**- After comparing the SBP and DBP by above three devices, we concluded that mercury shows higher reading compared to aneroid and automated devices and aneroid is showing lower values compared to mercury and automated.

Keywords: *Blood pressure, mercury sphygmomanometer, aneroid sphygmomanometer, automated BP device.*

INTRODUCTION

As we all know that blood pressure (BP) is a lateral pressure exerted by the moving column of blood on the walls of vessels. There are so many physiological factors like age, gender, meals, emotions, diurnal variation, climatic temperature, exercise, bladder distension, back ground noise, gravity posture etc, will affect BP[1]. From the beginning we know that effect gravity is one of the important factor, which affects BP. For every 'cm' below or above the heart level pressure increases or decreases by 0.77mmHg[2]. We always assume that sitting and supine BP readings are almost equivalent, as BP measurement is done in sitting positions in some clinics and in supine by most of the physicians, since they are often regarded as equivalent, but they are not[3]. Body posture is also one important factor, when measured in healthy individuals BP, drops on standing compared to sitting, supine and supine with crossed legs [4]. Another factor which will affect the BP measurement is type of device which we use to measure for example, manual Sphygmomanometer, Aneroid and the automated. From the beginning it is said that mercury Sphygmomanometer is the gold standard [5,6,7], though there are some limiting factors like subject bias, harmful effect of mercury[8, 9] and chances of getting White coat hypertension[10] office induced hypertension[11], but advantage is more accurate recording [6,12].On other hand if we see the aneroid Sphygmomanometer, limiting factors are, they are less accurate, need more maintenance and validated for accuracy against a standard mercury manometer at 6 months interval[13] ,advantage is inexpensive and portable and no harmful effect of mercury[14]. Automated devices although there is no subject bias, beat to beat measurement of BP, less chance of white coat hypertension, [10,11] still they also have limitations to use like they may fail to obtain the reading in conditions like in shock, patients having muscle tremors and abnormal heart rhythms and also the skill of measuring manual BP will be lost by the clinical staff [5]. Many studies have been done on these devices where they compared manual mercury Sphygmomanometer with aneroid Sphygmomanometer, some studies felt mercury Sphygmomanometer is better

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[12] and some felt aneroid Sphygmomanometer is better [9,14] other studies compared mercury with Automated, in their study automated devices were better [10,11]. No study has compared automated with aneroid .Aim of our study is to measure the BP by using all the three devices to find out the standard difference of BP between them.

Objectives

1. Comparison of BP recordings, measured using mercury Sphygmomanometer, aneroid Sphygmomanometer and automated devices

METHOD

It is a descriptive comparative study:

The study was conducted on normal healthy subjects between the age group of 18 to 25 years (MBBS and NURSING students) of Amala Institute Medical Sciences Kerala. Before the start of study, detail explanation of the study protocol was explained to all the student volunteers and informed consent was taken.

Inclusion criteria- both boys and girls between the age group of 18 to 25 years

Exclusion criteria- those who are suffering from both acute and chronic diseases, hypertension, diabetes, and cardiac diseases.

Protocol

Student volunteers were asked to come to Physiology lab during the afternoon between 3.30 to 4pm, their Height (Ht), weight (Wt) was taken, Body mass index (BMI) was calculated. Posture and position of the arm during BP measurement routinely followed as, Subject was in supine position, back was supported, legs were uncrossed, subject was completely relaxed, measuring of BP was done after 5 to 10 min of rest [15] , 5 to 7 subjects were asked to come in a day (depending on student's free time, if 7 students come, they were numbered from 1 to 7, if 10 come, they were numbered from 1 to 10), all had taken rest for 5 min, first on subject numbered 1, mercury sphygmomanometer cuff was tied on right arm, which is kept at the level of the heart, then SBP and DBP by auscultatory method was recorded, then same procedure was followed on remaining subjects with same instrument by the same person. At the end of 7th subject reading, Ist subject would have rested for more than 5 min, so then we have recorded BP using aneroid sphygmomanometer and noted SBP and DBP for all subjects one after the other using same aneroid instrument by the same person. Then last reading is by using automated device. Here again by the time we finished aneroid BP measurement for 7th subject, Ist subject would have rested for more than 5 min, then we took both SBP and DBP for all subjects one after the other using same automated device.

As the order of measurement was first mercury, second was aneroid, so just to avoid time bias, pilot study was done on 72 subjects, half with the reverse order of recording (first with aneroid and then with mercury). Statistical analysis showed there is no time bias.

Mercury Sphygmomanometer - This includes a mercury manometer, an upper arm cuff, a hand inflation bulb with a pressure control valve and requires the use of a stethoscope to listen to the Korotkoff sounds. Relies on the auscultatory technique. Instrument used was from Diamond.

Aneroid Sphygmomanometer - As for a mercury sphygmomanometer, except an aneroid gauge replaces the mercury manometer. The aneroid gauge may be desk mounted or attached to the hand bulb. Relies on the auscultatory technique. Instrument used was from Diamond Dial deluxe blood pressure apparatus.

Automated Device - This includes an electronic monitor with a pressure sensor, a digital display and an upper arm cuff. An electrically driven pump raises the pressure in the cuff. Devices may have a user-adjustable set inflation pressure or they will automatically inflate to the appropriate level, about 30 mmHg above the predicted systolic reading. On operation of the start button the device automatically inflates and deflates the cuff and displays the systolic and diastolic values. Pulse rate may also be displayed. Devices may also have a memory facility that stores the last measurement or up to 10 or more previous readings. Battery powered. Uses the oscillometric technique. Instrument used here was OMRON HEM-713 which is passed by AAMI=Association for the Advancement of Medical Instrumentation and recommended by BHS=British Hypertension Society [16].

STATISTICAL ANALYSIS

Sample size was calculated using SD of DBP from previous study, SD of DBP one device was 9.7 mmHg

and by other device was 9.33 mmHg, mean difference was 2.36, alpha - 5 %, power 80%, around 434 sample size according to calculation.

RESULTS

Independent t test

SBP: Table 1

Group	N	Mean	Std. Deviation	p value
Mercury	418	104.48	9.313	0.0001
Aneroid	418	99.70	10.810	

SBP: Table 2

Group	N	Mean	Std. Deviation	p value
Mercury	418	104.48	9.313	0.055
Automated	418	103.19	10.180	

SBP: Table 3

Group	N	Mean	Std. Deviation	p value
Aneroid	418	99.70	10.810	0.0001
Automated	418	103.19	10.180	

DBP:Table 4

Group	N	Mean	Std. Deviation	p value
Mercury	418	68.34	7.167	0.0001
Aneroid	418	63.57	6.173	

DBP:Table 5

Group	N	Mean	Std. Deviation	p value
Mercury	418	68.34	7.167	0.0001
Automated	418	64.57	6.603	

DBP:Table 6

Group	N	Mean	Std. Deviation	p value
Aneroid	418	63.57	6.173	0.024
Automated	418	64.57	6.603	

Table:7: Manual HR & Automated HR

Group	N	Mean	Std. Deviation	Std. Error Mean	p value
Manual HR	418	74.41	8.646	.423	0.847
Automated HR	418	74.28	10.937	.535	

Table: 8: Correlation with BMI

Variable	Pearson Correlation coefficient(r)	p value
Mercury SBP	0.246	0.0001
Mercury DBP	0.224	0.0001
Aneroid SBP	0.287	0.0001
Aneroid DBP	0.306	0.0001
Automated SBP	0.303	0.0001
Automated DBP	0.198	0.0001
Manual HR	-0.086	0.079
Automated HR	-0.078	0.111

DISCUSSION

As per the results done by statistical analysis using independent T test, it is clear from the tables 1 to 6(except table 2) there is significant difference of SBP and DBP readings recorded by the all three different devices. From the table 1 and table 4 it is clear that mercury device is showing significantly higher values in both SBP and DBP compared to aneroid which is comparable to other studies [14]. From the table 2 and 5, mercury device showed higher values in both SBP and DBP compared to automated which is comparable to previous study results [11], but only DBP is significant. From the table 3 and 6, automated showed significantly higher value compared to aneroid in both SBP and DBP. So over all mercury is showing higher values compared to aneroid and automated and aneroid is showing lower values compared to mercury and automated. These SBP and DBP values are statistically significant with the mean difference of 2, not clinically. Further studies have to be done for clinical significance keeping the mean difference of 5.

While taking these reading, with two students who found to be having higher readings for both SBP and

DBP by mercury (140/90), aneroid (142/84) but didn't show the same range with automated device (124/70), so it is not clear weather automated device will be helpful to identify the BP of individuals who are likely to be hypertensive. Advantage of automated device is According to previous studies automated will reduce the office induced hypertension [10, 11] and also they have memory for at least some 10 previous readings, but for consumers, whether medical or lay, accuracy should be of prime importance when selecting a device to measure blood pressure [16].

As in table 7 we compared manual to automated HR, there is no significant difference between them.

Pearson correlation was done with BMI as we can see in table 8, there is a significant correlation showing as the BMI increases there is increase in both SBP and DBP by all the three different devices.

In this study we tried to avoid biases like investigator bias as same person has taken all the readings, time bias, posture was also in supine for all subjects.

CONCLUSION

After comparing the SBP and DBP by above three devices, we concluded that mercury shows higher reading compared to aneroid and automated devices and aneroid is showing lower values compared to mercury and automated.

Conflict of Interest – Nil

Source of Funding- Self

Ethical Clearance – Got from institutional ethics committee

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Variation of ABO and RH Blood Groups among Male and Female Medical Students of KIMS, Hubli, Karnataka, India

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ABSTRACT

Background and objective: Knowledge of distribution of ABO and Rh blood groups is useful in health care planning, appropriate allocation of resources and also certain diseases or malignancies have predilection for certain blood groups. This study is aimed to determine frequency distribution of ABO and Rh blood groups as well as to determine the trend of prevalence of blood groups among medical students of KIMS, Hubli. **Materials and method**- This observational cross sectional study was done at department of physiology (haematology Lab) KIMS, Hubli, Karnataka, South India. A total 524 medical students, out of which 359 males and 165 females in the age group of 18-21 years were randomly selected for the study. **Results-** Statistical analysis was done using Chi-square test to determine statistical significance at "p" value of < 0.05. The distribution of ABO blood groups follow following pattern: O=34.92%, B=27.86% A =25.19%, AB=12.02% .There is no statistical significant relationship between male and female students in their blood groups.

Conclusion- Among our medical students O +ve and O-ve are most common and AB+ve and AB -ve are least common. Rh positive blood group seen in 94.9% of the students. Only 5.1 % of the students in our study group were Rh negative. Among Males 95.26% are Rh positive and 4.73% are negative. Among females 93.93% are Rh positive and 6.06% are negative.

Keywords*: ABO and Rhesus blood group, medical students,*

INTRODUCTION

Clinically the most important blood groups to be considered are ABO and Rhesus blood groups[1] .Knowledge of distribution of ABO and Rh groups is useful in health care planning, appropriate allocation of resources and also certain diseases or malignancies have predilection for certain blood groups[2]. The discovery of ABO blood groups by Karl Landsteiner was done in 1901[3]. Forty years later both Landsteiner and weiner discovered Rh D antigen[4]. Rhesus blood group system is the second most important blood group system due to its immunogenicty in Rhesus negative individuals in blood transfusion or pregnancy[5]. In order to avoid transfusion reaction and death related to it the single most important test performed in blood bank is to determine ABO blood groups[6]. These days, to eliminate the risk of transfusion reactions, the practice of autologous transfusion is followed by most of the physicians[7].

Based on the presence or absence of these inherited antigenic substances on the surface of RBCs individuals are divided into 4 major blood groups. A, B, AB and O in ABO system and Rh positive and Rh negative in Rh system (world edge), these antigens are complex oligosaccharides that differ in their terminal sugar[8]. On red cells these are mainly glycosphingolipids whereas in other tissues these are glycoproteins[9]

In addition to blood these antigens are found in many tissues that include salivary glands, saliva, pancreas, kidney, liver, lungs, testes and amniotic fluid [10].

The distribution of ABO and Rh blood groups varies in populations throughout the world. Previous literatures have found that the distribution of ABO and Rh blood groups varies from race to race. Studies conducted on western Europeans have shown the following observations-42%-group A , 9% group B,3% group

AB, and remaining 46% group O majority of eastern Europeans have a higher proportion of group B of up to 40% americans generally have frequencies of A ,B, AB and O blood groups of 41%, 10%, 4% and 45% respectively reports also indicate that although 85% of the Caucasians are Rh positive and 15% Rh negative over 99% of Asians are Rh positive[11]

By observing the above mentioned facts we were interested in finding the distribution of ABO and Rh blood groups among the students at our medical college KIMS, Hubli as the distribution pattern has not been studied extensively in this part of Karnataka (north Karnataka), and further to prepare a database for the blood bank of this institution and also to create awareness as who is exposed to which of the disease.

MATERIALS AND METHOD

This observational cross sectional study was conducted at department of physiology (haematology Lab) KIMS, Hubli, Karnataka, South India from july 2012 to sep 2012. A total 524 medical students from first to fourth year, out of which 359 were males and 165 were females were included in the study. Both males and females in the age group of 18-21 years were selected randomly for the study. An informed written consent was taken from all the students prior to the test. The sample blood was collected by finger prick method. The ABO and rhesus grouping was done by the tile method. A drop of blood from each student was diluted with 0.9% normal saline. This blood diluted with normal saline was transferred to three clean glass slides. These slides were labeled as A slide, B slide, D slide. A drop of monoclonal reagent anti A, anti B, and anti D were added to the drop of blood on these slides respectively with the help of separate droppers. Both blood and antisera were mixed well with the help of separate smooth glass rods. Results of agglutination were recorded immediately. Blood groups were determined on the basis of haemagglutination. Micro-agglutination was confirmed under the microscope.

STATISTICAL ANALYSIS

Statistical analysis was done using Chi-square test to determine statistical significance at p value of < 0.05.

RESULTS

Among 524, 359 were males and 165 were female medical students. The distribution of ABO blood group follows following pattern: O=34.92%, B=27.86% A =25.19%, AB=12.02%.

There is no statistical relationship between male and female students in their blood groups.

Table No: 01 Distribution of ABO associated with Rh positivity or negativity is as follows:

Blood group	No of students	% of students
O+ve	172	32.82
O-ve	11	2.09
B+ve	136	25.95
B-ve	10	1.9
A+ve	128	24.42
A-ve	4	0.76
AB+ve	61	11.64
AB-ve	2	0.38
	524	100

Table No: 02 ABO Blood Group Distribution among the Students (n = 524).

Sex	Blood group A	Blood group B	Blood group AB	Blood group 0	TOTAL
Male	94 (17.93%)	99(18.89%)	42 (8.01%)	124 (23.66%)	359
Female	38 (7.25%)	47 (8.96%)	21(4%)	59(11.25%)	165
Total	**132(25.19%)**	**146 (27.85%)**	**63 (12.01%)**	**183(34.91%)**	**524**

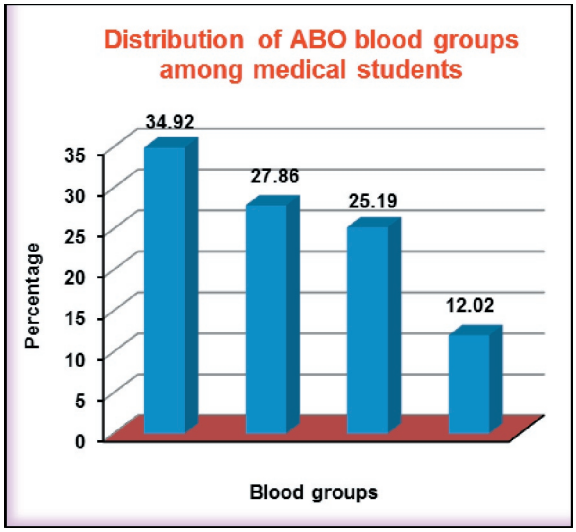
There is no significant relationship between male and female students in their blood group. Chi-square value = 0.415 and P-value = 0.9372 which is greater than 0.05.

Table No: 03 Rh blood group distribution among the Students (n = 524).

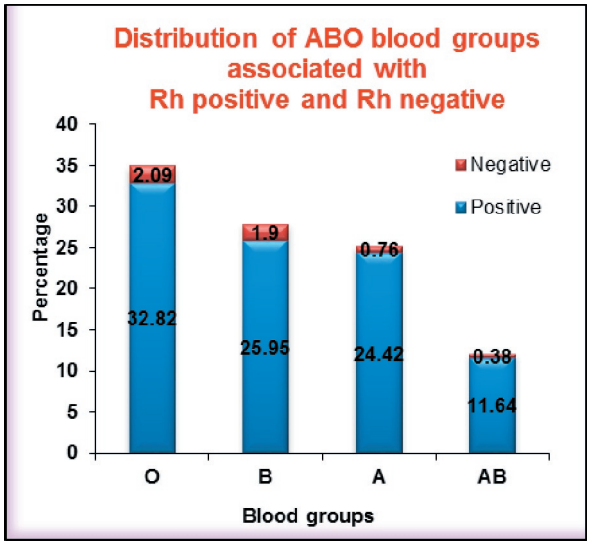
ABO Blood Group	*Rh Positive	* Rh Negative
A	128 (24.42%)	4 (0.76%)
B	136 (25.95%)	10(1.90%)
AB	61 (11.64%)	2(0.38%)
O	172 (32.82%)	11 (2.09%)
Total	497 (94.83%)	27 (5.13%)

* There is no significant difference between Rhesus positive and Rhesus negative students.

At p value >0.05 chi square value 2.849



Graph No: 01 Distribution of ABO blood groups



Graph No: 02 Distribution of ABO blood groups among medical students associated with Rh positive and Rh negative

DISCUSSION

The need for blood group prevalence study is not only important for transfusion medicine but also for organ transplantation. Results of a study done by Ahmed khurshid pasha et all at Nishtar medical college (NMC) Multan showed that the distribution of ABO blood groups in students revealed that blood group B was predominant among the students in order of B>O>A>AB[7]. Blood group B was also most common blood group in both the genders. However blood group A, AB and O were more common in male students.

Results of Shaik ya et all showed the predominance of blood group O similar to our study. [12]A prevalence study done by Nwache C A et all, from Nigerian population showed that blood group O>A>B>AB which is in contrast to our results which show B>A. However blood group O is most common AB is least common blood group in both the studies. [13]In Ravalpindi , a study done by Muhammad Iqbal, Alauddin Niazi showed that Blood group B+ve was the most frequent (31.2%). AB -ve was the least frequent (0.6%) which was similar to our study. The percentage of Rh+ve and Rh-ve blood groups was 92.2% and 7.8% respectively. [14]

The trends of prevalence of blood groups are same among total students, as well as among male and female medical students. There is no significant difference between Rh positive and Rh-negative students at p=o.o5, chi square value 2.849.Similar pattern of distribution is also observed in other studies. Rh negative blood group is documented as 5.5% in south India, 5% in Nairobi Kenya, 4.5% in Nigeria, 7.5% in Lahore, 7.7% in Ralwalpindi studies (Das et al, 2001; Mawuagi, 1999; Omatade et al, 1999; Majeed and Hayee, 2002; Bhatti and Amin, 1996). [15 16]

Like in many other studies blood group O has been found to be the most common blood group in our study. Here also blood group O +ve and O-ve have been found to be the most common among KIMS Medical students. The trend of prevalence of ABO and Rh groups among all medical students is: O>B>A>AB. Among Male students- O>B>A>AB. Among Female students - O>B>A>AB. Among our medical students O +ve and O-ve are most common and AB+ve and AB -ve are least common.

CONCLUSION

Among our medical students O +ve and O-ve are most common and AB +ve and AB -ve are least common. The same observation has been found separately among male and female medical students.

The trends of prevalence of blood groups are same among total students, as well as among male and female medical students.

Knowledge of blood groups is very important as this not only saves lives of patients when a transfusion is required but also predicts who is prone to which of the diseases as many diseases have association with certain blood group such as blood group o is a risk factor for duodenal ulcer.

Study conducted by maliyanna itgappa among medical students of SSIMS Davangeri and show that commonest ABO blood group in males was B group followed by O, A and AB groups. The frequency of Rh positive was 95% while Rh –ve 5% and group O was predominant in females and B group predominant in males.

Present study could have several significant implications .It provides information to various blood banks for transfusion purposes and to prepare a data base for blood bank of this institution. To link ABO blood groups to certain diseases and to create awareness as who is exposed to which of the diseases.

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Ethical Clearance: Taken

Source of Funding: Self

Conflict of Interest: Nil

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Effect of Occupational Stress on Autonomic Modulation

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ABSTRACT

Driving is a hazardous occupation and the drivers exposed to this profession undergo autonomic changes. HRV, the non-invasive technique is used to assess the autonomic adjustment in the cardio vascular system is used to assess the stress induced autonomic modulation in drivers. The time and frequency domain of HRV were recorded in 61 truck drivers in normal and deep breathing condition. The result of time domain of HRV showed that HRV decreased with experience. Also while the LF component increases with experience, the HF component decreases. Thus the results indicate that as the duration of driving increased the sympathetic activity increased and parasympathetic activity decreased.

Keywords:- *HRV, LF,HF, stress, occupational hazards.*

INTRODUCTION

In the present day world every occupation induces various degrees of stress on individual although the perception may vary in individual to individual and in certain occupation it is greatest and such occupations are called hazardous occupation. Stress induces a wide range of physiological and or behavioral changes that have evolved along phylogeny which take place under different situations[1].

Shift work is associated with an increased rate of cardiovascular disease and accidents. Discordance between circadian rhythm of stress related biological variables and the work sleep schedule explains the reduced efficiency of work.

Ha M et al (2001)[2] showed that there is an increase in both systolic and diastolic blood pressure according to shift duration.

Long duty taxi driving raises blood pressure and may increase cardiovascular risk. It is shown that as a conflict between circadian rhythm of autonomic activity, and work activity at night may also result in increased cardiovascular risk[7].

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Heart rate variability (HRV) is a non invasive test to asses the cardio vascular autonomic regulation[5]. HRV has become the conventionally accepted term to describe variations of both instantaneous heart rate and RR intervals[6]. HRV analyzes the tonic base line autonomic functions[3,4].

Martica Halll et al (2004)[8] showed that changes in HRV with acute stress may represent one pathway to disturbed sleep. It is also evident from the study that stress related changes in heart rate variability are associated with significant morbidity and increased risk of mortality[8].

There was a significant decrease in HRV in shift workers. These results show that there are negative health effects by shift work on cardiovascular system[6].

It has shown that continuous weekly changes in working time alter the HRV in the cardiovascular diseases in shift work[9].

Apparies et al (1998)[10], showed that there was a decreased HRV and increased heart rate in drivers who were driving longer combination vehicles, and also Suggested that fatigue contributes to driving related accidents and fatalities.

The stress normally operate through cortico hypothalamo autonomic nerves system axis. The degree of intensity of the stress on individual can be better

studied by the autonomic modulation takes place in that individual.

So in this study the autonomic changes of one of the hazardous occupation in which drivers were evaluated to predict or prevent any hazardous occupation induced health disorder that may set in as to precipitate in future, may help them to improve their life expectancy of health.

MATERIALS AND METHOD

Subject: Volunteer's among the truck drivers from the VRL logistics Ltd participated in the health clinic of the college. The healthy males (61) were agreed to participate in this study. Time of the visit was between 10.00AM. to 11.30 AM, they were requested to come in a relaxed condition and quiet mood.

INCLUSION CRITERIA

1. Healthy males.
2. Males between the age group 18-48 years.
3. Taken regular duties as truck drivers.

EXCLUSION CRITERIA

1. with known hypertension.
2. with known cardiac disease.
3. on treatment for any other disease.
4. Complaint of fever.

Parameters: Duration of occupation and HRV

Measurement of HRV:

ECG appliances (BPL) with Jelly and electrode.

- Digital data Acquisition system
- HRV soft 1.1 VERSION, AIIMS, NEW DELHI.

A high quality ECG recording was taken under standardized condition to minimize artifacts. The ECG signal was first recorded in analog and then digitally converted. HRV was than analyzed by using the software HRV soft 1.1 version, AIIMS, New Delhi. The software used automatically gives the values in the time domain and frequency domain.

Method of recording : In normal and deep breathing.

Duration of occupation: obtained orally from the individual

STASTICS: The stastical analysis was done using ANOVA (Analysis of variance), student's unpaired -T test, Mannwhitney U test.

RESULTS

The 61 subjects were grouped according to their work experience into two groups.

The drivers (36) whose working experience was less than 5 years were included in group I and their mean work experience was 2.8 ±1.5 years. The group II contains 25 subjects with work experience more than 5 years. The mean experience of group II was 9.7±3 years.

The time domain and frequency domain of these two groups HRV in normal and deep breathing condition were compared and analyzed.

Table I shows the analysis in normal breathing and table II shows the analysis in deep breathing.

Tab: I Effect of experience on time and frequency domain heart rate variability

EXP	N	MEAN	Std deviation	Z
HRV <=5 >5	36 25	27.1108 15.1648***	8.74463 5.66055	4.96400 P<0.001
LF <=5 >5	36 25	26.3116 55.8047***	19.10114 6.26252	5.48500 P<0.001 vhs
HF <=5 >5	36 25	50.7886 23.7040***	21.54542 9.56846	5.00100 P<0.001 vhs

***-Very highly significant

The time domain HRV analysis showed that the mean HRV in normal breathing of group I was 27.1±8.7 and in group II was 15.1±5.6. The HRV in group I was significantly higher than that of group II (p=0.001), when compared with the group II.

The deep breathing showed that the mean HRV of group I was 33.7±20.0, which was significantly higher (p=0.001) than the group II 20.0 ±5.5. .

Further the frequency domain analysis of LF and HF, in normal breathing showed the following. The mean LF of group I was 26.3±6.2 and that of group II was 55.8±19.1, the LF of group II value was significantly more than group I (p=0.001). But the HF also showed significantly (p=0.001) higher value in group I (50.79) when compared with the group II (23.70).

The deep breathing record of frequency domain analysis showed that the mean LF of group I was 58.5±14.7and that of group II was 81.4 ±14.3. When analyzed statistically, group II showed very highly significant when compared to group I (p=0.001). Also in deep breathing the mean HF of group I was 17.8±6.06 and of group II was 11.2±5.2. It showed group I value was very highly significant than the group II (p=0.001). (table II)

Tab: II Effect of experience on time and frequency domain heart rate variability in deep breathing

EXP	N	MEAN	Std deviation	Z
HRV DB <=5 >5	36 25	33.7953 20.0084***	8.66530 5.59081	5.55800 P<0.001 vhs
LF DB <=5 >5	36 25	58.5880 81.4114***	14.30321 14.77274	4.79500 P<0.001 vhs
HFDB <=5 >5	36 26	17.8819 11.2992***	6.06355 5.22939	3.79800 P<0.001 vhs

***-Very highly significant

DISCUSSION

In India main source of transportation of goods is land transport, on which the economy is dependent which is mainly carried out by the way of trucks. Truck drivers are the one who drive long distance and these drivers may have to drive vehicles for 11-14 hours a day, even in nights, holidays and week ends. These drivers are exposed to the various hazardous atmospheres while driving, so the occupation of the drivers is said to be hazardous occupation. These drivers because of the working life style are more prone for increased stress and related health hazards.

Though the heart has its own rhythmicity it is regulated by the autonomic nervous system on time to time adjustment needed to cope up body's need. Most of the cardiac ailment is precipitated due to involvement of the autonomic nervous activity. A decrease in HRV indicates increase in sympathetic activity and decrease in parasympathetic activity, which may tend to cardiac problems. On the other hand an increase in HRV indicates increase in parasympathetic activity which is more or less having cardio tonic effect. During deep breathing the vagal activity is increased due to respiratory maneuver which spills over the cardiac tissue and the HRV under deep breathing condition is better indicator of parasympathetic role in heart.

In this study, the time domain analysis of HRV showed as the experience increases the HRV decreases, indicates the shifting of dominance towards sympathetic activity proportionate to experience.

Studies showed that changes in HRV with acute stress may represent one pathway to disturbed sleep. It is also evident from the study that stress related changes in heart rate variability are associated with significant morbidity and increased risk of mortality [8].

Shift work is associated with an increased rate of cardiovascular disease and accidents. Discordance between circadian rhythm of stress related biological variables and the work sleep schedule explains the reduced efficiency of work. It has shown that continuous weekly changes of time of work increases cardiovascular diseases in shift work[9].

In our study increased experience associated with decreases in HRV may be due to work related stress, as the drivers are exposed to a various degrees of stress during driving.

In order to find out the degree of shift in the autonomic nervous system (sympathetic and parasympathetic) affected most, the frequency domain analysis was also carried out in these subjects.

Accordingly, the results showed that there was an increase in the LF component and decrease in HF component as experience increases, this indicates while sympathetic activity increases, parasympathetic activity decreases.

The study of effect of HRV in driving mental fatigue, found that sympathetic activity of the subjects enhanced after the simulated driving while HF component decreased[11]. The study of effect of different vibration frequencies on HRV and driving fatigue showed that there is a significant decrease in all indices of HRV, where there is increase in the LF component and decrease in the HF component [12] was in agreement with the study.

In our study with the increase in the experience there is increase in the LF component, where as there is a decrease in the HF component that may be due to these stress factors involved in the driving.

CONCLUSIONS

Based on this study, the following conclusions are drawn.

- The present work atmosphere of truck drivers has created a high stress factor on the individual.
- Because of stress, there has been a profound influence on the autonomic nervous system.
- Sympathetic over activity which is related to STRESS has a major impact on health status of the individual as evident from HRV analysis.

RECOMENDATION

Stress factor should not be overlooked by the companies recruiting the drivers.

1) Pre recruitment health checkups

2) Giving good amount of time for the recruit before taking up the job so that they get enough time for preparation.

3) Changes in the working patterns, give them adequate rest before starting new schedule.

4) Post recruitment half yearly/yearly detailed health examination, counseling.

Ethical Clearance- Taken from institutional ethical committee KIMS Koppal

Source of Funding- Self

Conflict of Interest: Nil

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The Correlation of Breath Holding Time between Non Addict or Addicts (Smoker & Chewer) Male and Female Elderly Indian Population

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ABSTRACT

The collect a substantial amount of data relating to physical fitness in elderly peoples and this findings may be helpful for cardiologist with maximum safety and minimum mortality and morbidity or clinicians in reaching the appropriate diagnosis.

Breath holding time was performed on 110 healthy (84 male and 26 female) subjects aged 60 years and above. 49 subjects addict to either tobacco smoking or tobacco chewing and 61 were non-addict for tobacco. They were divided into 4 groups: Group I (60–64 years), Group II (65–69 years), Group III (70–74 years) and Group IV (75 years and above). In the (84) elderly male (60yrs above) the average breath holding time (BHT) was 28.20 ± 8.51/sec and the elderly non Addicts male (37) mean were 28.48 ± 7.20/sec and addict (Smoker and Chewer) 47 elderly male 28.06 ± 9.59/sec . The elderly (26) females (60 yrs above) mean were 26.11 ± 6.63 sec and non addict elderly female (14) mean 28.5 ± 8.28/sec and addict (12) elderly female (smoker and chewer) mean 24.o7 ± 3.73/sec. Breath holding time shows a declining pattern with age in all the age groups of men, which is statistically significant ($p < 0.5$). However, in female although the breath holding time also shows an apparent declining pattern with age in all age groups but the relationship is statistically insignificant ($p > 0.05$).

Keyword:- *Stop watch, elderly peoples (Male & Female), Indian population,*

INTRODUCTION

In India, the first step towards such type of the survey named as 'General Health Survey' was conducted in the rural field practice area of the Singur Health Centre of All India Institute of Hygiene & Public Health, Calcutta (Lai and Seal, 1949).[1] Since then various surveys have been done by various public health workers.

In the era of changing patterns of health and disease in developing country like India and also due to breaking up of various social and economic barriers, and increased ratio of older age population, the importance of health surveys is increasing day by day. The knowledge about the changing pattern of health and disease and the allied information regarding the health status of older age group can only be projected by carrying on such survey from time to time in various parts of the country.

Nandel and Widdicomtpa(1975)[2] concluded that the inhalation of tobacco smoke causes an immediate rise in airway resistance which persists for at least an hour. This rise of resistance in the airway is a reflex response of dust particles in the epithelial lining of the larynx, the trachea, and larger bronchiole.

Anderson et al. (1978)[3] in their WHO publication quoted that Framingham longitudinal studies indicated that high physical performance, capacity, i.e., a strong hand grip, high vital capacity and a low resting heart rate, are associated with a lower than average incidence and severity of cardiovascular pathology.

Quantitative assessment of physical fitness in the elderly age group Is the most complex and controversial problem in applied physiology. This situation arises in part from lack of general agreement as what constitutes fitness for withstanding various types of stresses and from lack of agreement as what measurement exposed

to the same stress.

Another problem with the older age group is the higher risk for the various tests based on exercise.

Therefore, in the present study the physical fitness of this age group is assessed by the various cardiorespiratory parameters at rest as also advocated by "Royal Air force of England".

As early as 1967 Jain, et al.[4]reported that there was a stiffness of the thoracic cage and also loss of elastic recoil of lungs in elderly people. So there was deterioration in the strength of respiratory muscles. They also showed the loss of elastic recoiling prevents the closure of the respiratory bronchioles during expiration. Various factors were responsible for the reduction in ventilatory function in the elderly age group[5] .

MATERIAL AND METHOD

The present study "The Cardiorespiratory Function Tests" was conducted on a randomly selected 110 apparently healthy subjects of 60 years and above age group belonging to both the sexes at Agra.

Breath holding time was performed on 110 healthy (84 male and 26 female) subjects aged 60 years and above. 49 subjects addict to either tobacco smoking or tobacco chewing and 61 were non-addict for tobacco. They were divided into 4 groups: Group I (60–64 years), Group II (65–69 years), Group III (70–74 years) and Group IV (75 years and above).

Breath Holding Time is measured by stopwatch. The subject was asked to take a quiet inspiration and hold it as long as possible. Duration of breath holding was measured by stopwatch.

The following Cardiorespiratory function tests were carried out on these subjects:

1. Breath holding time in seconds.

Breath Holding Time:- The instrument used was the stop watch. The subject was asked to take a quiet inspiration and hold it as long as possible. Duration of breath holding was measured by stopwatch. Three readings were taken. Best of the three was taken for record.

Precautions:

(i) The subject was instructed to take rest for at least 3 minutes.

(ii) Three consecutive readings with an interval of one minute were taken. If the rates were not same then the subject was instructed to take more rest.

STATISTICAL ANALYSIS

The data were analyzed using Microsoft Excel, SPSS version 21, Mean and standard deviation (SD) were calculated. p-value $P \geq 0.05$ was considered statistically insignificant.

OBSERVATIONS

The present study of evaluation of cardio-respiratory functional ability in the elderly age group was conducted with the objective to determine the effect of male and female in the elderly population**,** affect these parameters. Under this endeavor, very simple multidimensional group of various cardiorespiratory function tests comprising of breath holding time, was carried out and studied compare with male and female in elderly population. Out of these 110 subjects, 84 were male and 26 females. showing table no.1

49 subjects addict to either tobacco smoking or tobacco chewing and 61 were non-addict for tobacco. Showing table no 2.

The details of these findings in various age groups and different sexes are shown in Tables no 3.

Following cardio-respiratory function tests were performed on these subjects

Breath holding time (BHT) in seconds

For the sake of convenience the subjects were grouped in male and female subgroups. Each subgroup was further divided in four subgroups as follows :

Group I	: 60 yrs to 64 yrs
Group II	: ↓65 yrs to 69 yrs
Group III	: ↓70 yrs to 74 yrs
Group IV	: ↓75 yrs and above.

For each group the mean age, mean height, and mean weight were calculated as shown in Table 3.

The mean values and standard deviation of all the parameters with respect to age group, comparative evaluation of these parameters in the corresponding

age group of male and female subjects were calculated and the findings are tabulated. Also the assessment of correlation of effect of tobacco addiction (tobacco smoking and tobacco chewing)'with all the parameters studied was done.

Finally, the statistical correlation in the form of r, t and p values of each parameter was calculated as shown in each table. Though a number of workers have reported the respiratory parameters on Indians, most of the data are on much younger age groups and especially in students. Amongst the reported data available on the elderly population, our values are much closer to the values obtained by Pathak and Mehrotra et al. (1989)[6] who studied the respiratory function tests in the elderly population of Bombay and Bhargava et al. (1973)[7] who conducted the respiratory function tests in elderly subjects in Bhopal.

The findings of our study are much lower as compared to European contemporary subjects reported by Dreyer et al.[8]

Deterioration of respiratory function tests with age might be the resultant effect of a number of factors, including the deterioration in the lung tissue; a reduction in the strength of the respirator muscles and an increase in stiffness of the thoracic cage. The intrapulmonary changes are probably partly due to an impairment of the nutrient blood supply from the bronchial arteries; a diminished permeability of cell membrane and an alteration in the molecular structure of the collagen and other tissue, collagen fibers increase in number and change in quality with age.

The changes are likely to have the effect of increasing the rigidity and reducing the tensile strength of the tissue as well as by reducing both the viability of the cells and their recuperative powers. The time course of these manifestations of the process of ageing varies from one individual to another and also in male and female sexes. The ethnic difference between the Indians and others may be aggravated by damages caused by exposure to polluted atmosphere, low socio-economic status, genetic differences, body built and other climatic variables.

The ventilatory capacities show a consistent decline with age. The decline is further augmented by smoking/chewing tobacco. The ventilatory capacity is a function of the strength of the respiratory muscles and the resistance to movement of the lung and the chest wall and the reduction that occurs with age is probably due to change in all these variables. An assessment of the relationship between the effects of tobacco addiction and lung function in both the sexes, it was revealed that the magnitude of decline of respiratory function tests is far more in tobacco addict than non-addict subjects and the finding happens to be statistically significant in both the sexes for vital capacity ($p < 0.01$) but the relationship was insignificant for BHT ($p > 0.05$) and PEFR ($p > 0.05$) in both the sexes.

The present study reveals a statistically significant deterioration of all the cardiorespiratory function tests with the increase of age in both the sexes and the deterioration was more tobacco addict subjects (tobacco smokers and tobacco chewers) as revealed by the p-values depicted in the tables no.2

Greater decline in respiratory function tests in tobacco addicts again enjoys a massive support from other workers (Donald I. Peterson et al., 1968[9]; George W. Gomstock et al., 1970[10]; Lower and Khosla, 1972[11]), In their separate work on the effect of smoking and respiratory function tests, these workers have also reported a declining pattern in respiratory function tests in tobacco addict. Similar studies were conducted by Carl C, Seltzer et al. (1974)[12], Manfeda et al. (1982)[13], Damodar et al. (1983)[14], Douglas et al. (1985)[15] and they also reported a declining lung function test in chronic smokers.

Tobacco smoking carries a number of substances which may exert an effect on the body. They include particles of dust which disturb the function of airway, carbon monoxide, which hampers the respiratory function of the blood and possibly damages the myocardium, tar and oxides of sulphur and nitrogen, which exert an irritant effect on the bronchial epithelium and may predispose to emphysema and nicotine which increases the cardiac frequency and elevates the systolic B.P. The magnitude of the effects of these agents upon the respiratory tract varies with the type of tobacco and its preparation. The inhaling of tobacco smoke causes an immediate rise in the airway resistance which persists for at least an hour. Nandel and Widdicomba(1975)[2] have shown that this change is a reflex response to the deposition of particles of dust upon the epithelial lining of the larynx, the trachea and the larger bronchial, but the intensity of response varies from individual to

individual. Smoking may reduce the volume of the blood in lung capillaries.

RESULT

In the (84) elderly male (60yrs above) the average breath holding time (BHT) was 28.20 ± 8.51/sec and the elderly non Addicts male (37) mean were 28.48 ± 7.20/Sec and addict (Smoker and Chewer) 47 elderly male 28.06 ± 9.59/sec . The elderly (26) females (60 yrs above) mean were 26.11 ± 6.63 sec and non addict elderly female (14) mean 28.5 ± 8.28/sec and addict (12) elderly female (smoker and chewer) mean 24.o7 ± 3.73/ sec. Breath holding time shows a declining pattern with age in all the age groups of men, which is statistically significant($p < 0.5$). However, in female, although the breath holding time also shows an apparent declining pattern with age in all age groups but the relationship is statistically insignificant ($p > 0.05$).

No statistical difference in pulse rate between tobacco addicts compared with non-addicts, was observed ill the present study.

Table -1: Comparative evaluation of breath holding time of total number of male and female subjects studied (n = 110)

Sex	No.	Mean	S.D
Male	**84**	**28.20**	± 6.63
Female	**26**	**26.11**	± 6.63

t = 1.39, P >0.05

Table – 2: Correlation of breath holding time between non-addicts and addicts (tobacco smokers & tobacco chewers) male and female subjects studied (n - 110)

Type	No.	MALE		NO	FEMALE	
		MEAN	S.D		MEAN	S.D
Non-Addict	37	28.48	± 7.20	14	28.5	± 8.28
Addict (Smoker + Chewer)	47	28.06	± 9.59	12	24.07	± 3.73

Table no.3: Comparative evaluation of breath holding time of different age groups in male and female subjects studied (n=110)

Age Group in years	BREATH HOLDING TIME (IN SECONDS)					
	No.	Male (n =84)		Female (n=26)		
		Mean	S.D.	No.	Mean	S.D.
60 – 64	26	36.96	± 9.8	11	27.72	± 8*67
↓ 65 – 69	20	32.25	± 4.63	8	27.33	± 5.26
↓ 70 – 74	17	26.94	± 9.61	4	26.50	2.17
↓ 75+	21	26.65	± 4.83	3	23.75	± 2.51

CONCLUSIONS

Under this Endeavour (a) a predesigned Performa (as suggested by W.H.O) was filled up to obtain the details for subjective evaluation, and (b) very simple multidimensional groups of various cardiorespiratory function test comprising of d breath holding time was carried out.

From the study point of view, all the subjects were grouped in four subgroups i.e., 60-64 yrs, 65-69 yrs, 70-74 yrs and 75+ yrs. The values obtained were statistically evaluated in terms of p values.

The present study reveals a statistically significant deterioration of all the cardiorespiratory function tests with the increase of age in both the sexes and the

deterioration was more tobacco addict subjects (tobacco smokers and tobacco chewers) as revealed by the p-values depicted in the tables no.2

Ethical Clearance:-Yes

Source of Funding :-Self

Conflict of Interest:- None

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Physiology of ABO and Rhesus Blood Group System and its Prevalence and Correlation with Possible Transmission of Infections During Screening in Hassan District

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ABSTRACT

Introduction: With the discovery of blood group system, blood transfusion has become routine interventional modality for various blood disorders. Blood grouping and cross matching are pre-requisites to ensure safe compatible transfusion. Many diseases are transmitted during transfusion. This hazards can be minimized by proper donor selection and screening. The present study was conducted to study the physiology of ABO and Rhesus blood group system and its prevalence and correlation with possible transmission of infections during screening in Hassan district.

Materials and method: This retrospective study was conducted at the blood bank of a Hassan Institute Medical Sciences for a period of three years from January 2014 to December 2016. The blood was collected from all donors, grouped by standard procedures and was screened for various diseases. The data was be statistically analyzed.

Results: ABO and Rhesus blood group of 14,413 donors was determined. The most and least prevalent blood group was O positive (39.04%), and AB negative (0.36%) respectively. Prevalence of Rh positive donors (95.32%) was more than Rh negative donors (4.68%). A total of 0.92% was found to be positive for diseases. Prevalence of Human Immunodeficiency Virus, Hepatitis B virus, Hepatitis C virus and Syphilis are 0.076%, 0.8%, 0.014% and 0.02% respectively. Statistically significant association was found between HIV and Hepatitis B infection with blood groups (P<0.05).Higher prevalence of HIV, HBV, HCV and syphilis was found in O positive, B negative , A positive and O positive blood group respectively. However subclinical asymptomatic malaria positive donors were not found in present study.

Conclusion: The most prevalent blood group in Hassan population was O positive. The most common Transfusion transmitted infections seen is Hepatitis B infection.

Keywords: *ABO, Rhesus Blood group, Transfusion transmitted infections, Human Immunodeficiency Virus, Hepatitis B virus, Hepatitis C virus, Syphilis, Malaria parasite.*

INTRODUCTION

With the discovery of blood group system by Karl Landsteiner in 1900 and Rhesus system by Karl Landsteiner and Weiner in 1940, blood transfusion has become routine interventional modality for various blood disorders.[1] More than 30 blood group system are discovered based on the antigens present on the surface of red cell membrane. Out of more than 400 antigens only A and B are found to be immunologically significant.[2] These antigens are complex oligosaccharides and glycoprotein that differ in terminal sugar moieties and exhibit Mendelian dominant inheritance. Based on these two antigens individuals are classified into four major blood groups A, B, AB and O. In Rhesus system

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only D antigen is immunologically significant. Based on presence or absence of D antigen individuals are classified into Rh D positive and Rh D negative groups. Prevalence of ABO and Rhesus Blood Groups varies in different races, ethnic groups, geographical areas etc.[3,4,5] 'H' antigens is present on membrane of all blood groups which is formed by H gene, which codes for fucose transferase and adds terminal fucose. 'A group' individual contains additional N-acetylgalactosamine and 'B group' individual contain additional galactose on the H antigen which is expressed by different tranferases.[3]

Need of blood transfusion has been increasing tremendously nowadays. Modern blood banking techniques has helped to transfuse not only whole blood but also blood components like plasma components, white blood concentrates, packed red cells, platelets etc. Blood grouping and cross matching are pre-requisites to ensure safe and compatible transfusion. Many diseases like cardiovascular diseases, cancer, diabetes, peptic ulcer, carcinoma cervix, skin diseases and Personality traits are found to be associated with blood groups.[6] Genes encoding and regulating the expression of these blood group antigens and natural defence mechanism of the individual may be responsible for increased or decreased susceptibility of the individual to various diseases.[7] Many diseases like hepatitis, Acquired Immuno-Deficiency Syndrome (AIDS), Syphilis, infectious mononucleosis, toxoplasmosis etc are transmitted through blood during transfusion. Genetic and environmental factors, interaction of organisms with antigens on membrane may be cause for genesis and transmission of diseases.[8-10] The risk increases in patients receiving multiple transfusions. The hazards of transmission of diseases can be minimized by proper donor selection and screening.[9]

OBJECTIVE

To study the physiology of ABO and Rhesus blood group system and its prevalence and correlation with possible transmission of infections during screening in Hassan district.

MATERIALS AND METHOD

This retrospective, qualitative study was conducted at the blood bank of a Hassan Institute Medical Sciences, Hassan for a period of three years from January 2014 to December 2016. Data was collected from the blood bank. A Blood sample of 14413 apparently healthy voluntary donors and relative donors (replacement donors) who were not on any treatment, within the age group of 18-60 years, with Hemoglobin more than 12.5 gram% and body weight above 45-50 kg was collected after fulfilling all the eligibility criteria of a healthy donor. Written consent was obtained for various tests to be carried out for the transfusion transmitted diseases and their data usage for research or transfusion purposes from each donors as a routine blood bank procedure. ABO grouping and Rh typing was done by agglutination method by using commercially available standard antiseras i.e. anti A, anti B, and Anti D (Bhat Bio-Tech India private Ltd). Weak D antigens (Rh D^u) were recognized by most reliable Rh D^u test and positives were considered as Rh positive (Coomb's method).[11,12] Then all blood samples were screened for Human Immunodeficiency Virus (HIV-1 & 2), Hepatitis B virus (HBV), Hepatitis C virus (HCV), Syphilis and Malaria Parasite (MP). Third generation enzyme linked immunosorbant assay (ELISA -Erba Lisa ® HIV Gen 3 from Transasia Bio-medicals Ltd) was used to detect antibodies to HIV-1 and HIV-2 virus in human serum and plasma. High sensitive enzyme linked immunosorbant assay (ELISA-Erba Lisa ® SEN HBsAg from Transasia Bio-medicals Ltd)) was used to detect surface antigen of Hepatitis B (HBsAg) virus in human serum and plasma. HCV ELISA test Hepa-scan (Bhat Bio-Tech India private Ltd) was used to detect antibodies to Hepatitis C virus (HCV).Then samples were sent to central laboratory for Individual donor nucleic acid testing (ID-NAT) for earlier detection of viral nucleic acid which are in window period of HIV, HBV and HCV infections. ID-NAT helps to detect the presence of viruses missed by ELISA. Its regular use in blood banks would ensure safer blood transfusion.[13, 14] Rapid plasma reagin test (RPR-SPAN- Arkray Healthcare Pvt Ltd) was used to diagnose syphilis. And peripheral smear of all donors are examined for Malaria parasite.

STATISTICAL ANALYSIS

The data was statistically analyzed using Statistical Package for Social Sciences (SPSS) for windows and EpiInfo software by simple percentage and comparison. Chi-square test was carried out to evaluate the significance in different groups. The mean difference will be significant at $P<0.05$ level. Conclusion was drawn based on outcome of this statistical treatment.

RESULTS

ABO and Rh blood group of 14,413 donors was determined using antisera. Majority of donors belonged to age group between 18-40 years. The percentage distribution of voluntary and replacement or relative donor (ratio 2.1:1) and males and females (ratio 20.4:1) are shown in table 1.In Hassan population the distribution of the ABO and Rh blood group system are as shown in table 2.The most prevalent blood group in Hassan district was O positive (39.04%), and least prevalent was AB negative (0.36%).The prevalence of other blood groups like A+,A-,B+,B, AB+,O- are 24.63%,1.22%,25.47%,1. 11%,6.16% and 1.98% respectively(O>B>A>AB). The prevalence of Rh positive donors (95.32%) was more than Rh negative donors (4.68%).

All the blood samples were screened and the results are as shown in the table 3 and table 4. A total of 132 donors (0.92%) were found to be positive for one or more diseases. Out of which 124 (93.94%) was Rh positive and only 8(6.06%) was Rh negative. And these Rh negative donors were found to be infected by hepatitis B infection. Prevalence of HIV, HBV, HCV and syphilis are 11(0.076%), 116(0.8%), 2(0.014%) and 3(0.02%) respectively (table 3). Statistically significant association was found between HIV and Hepatitis B infection with ABO and Rh blood groups (P<0.05). There was no statistically significant association between Hepatitis C and Syphilis infections with blood groups (P>0.05). Higher prevalence of HIV was found in O positive blood group 7(0.124%) followed by B positive 2(0.0.054%), A positive 1(0.03%). Higher prevalence of HBV was found in B negative blood group 3(1.86%) followed by O negative 5(1.75%), AB positive 11(1.24%), B positive 33(0.89%), O positive 39(0.69%), A positive 5(0.7%). Higher prevalence of HCV was found in A positive 1(0.028%) followed by O positive blood group 1(0.017%). Higher prevalence of syphilis positive was found in O positive blood group 2(0.035%) followed by B positive 1(0.03%).However subclinical asymptomatic malaria positive donors were not found in present study. And all symptomatic clinical malaria positive donors were excluded from our study.

Table 1: Distribution according to type of donors and gender

Samples in year	Total Donors	Voluntary Donors (%)	Replacement Donors (%)	Males (%)	Females (%)
2014	4578	2791(60.96)	1787(39.08)	4300 (93.92)	278(6.07)
2015	4912	3583(73.94)	1329(27.05)	4683(95.33)	229(4.66)
2016	4923	3470(70.48)	1453(29.5)	4757(96.62)	166(3.37)
Total	14413	9844(68.29)	4569(31.7)	13740(95.33)	673(4.66)

Table 2: Distribution according to type of blood group and in percentage

Samples in year	Total Donors	A + (%)	A-(%)	B+ (%)	B –(%)	AB+ (%)	AB- (%)	O+ (%)	O- (%)
2014	4578	1111 (24.26)	60 (1.31)	1124 (24.55)	50 (1.09)	272 (5.94)	09 (0.19)	1843 (40.25)	109 (2.38)
2015	4912	1214 (24.71)	65 (1.32)	1272 (25.89)	52 (1.05)	320 (6.51)	21 (0.42)	1880 (38.27)	88 (1.79)
2016	4923	1225 (24.88)	51 (1.03)	1276 (25.91)	59 (1.19)	297 (6.03)	22 (0.44)	1904 (38.67)	89 (1.8)
Total	14413	3550 (24.63)	176 (1.22)	3672 (25.47)	161 (1.11)	889 (6.16)	52 (0.36)	5627 (39.04)	286 (1.98)

Table 3: Distribution according to infected (positive) blood donors in each year

Samples in year	Total Donors	HIV (%)	HBV (%)	HCV (%)	Syphilis (%)	MP (%)	Total
2014	4578	05(0.11)	31(0.67)	01(0.02)	03(0.06)	0(0)	40(0.87)
2015	4912	03(0.06)	45(0.91)	01(0.02)	0(0)	0(0)	49(0.99)
2016	4923	03(0.06)	40(0.81)	0(0)	0(0)	0(0)	43(0.87)
Total	**14413**	**11(0.07)**	**116(0.8)**	**02(0.013)**	**03(0.02)**	**0(0)**	**132((0.92)**

Table 4: Distribution of infected (positive) donors according to blood group type

Blood group	Total donors	HIV (%)	HBV (%)	HCV (%)	Syphilis (%)	MP (%)	TOTAL (%)
A Positive	3550	1 (0.03)	25 (0.7)	1 (0.03)	0	0	27 (0.76)
A Negative	176	0	0	0	0	0	0
B Positive	3672	2 (0.054)	33 (0.89)	0	1 (0.03)	0	36 (0.98)
B Negative	161	0	3 (1.86)	0	0	0	3 (1.86)
AB Positive	889	1 (0.11)	11 (1.24)	0	0	0	12 (1.35)
AB Negative	52	0	0	0	0	0	0
O Positive	5627	7 (0.124)	39 (0.69)	1 (0.017)	2 (0.035)	0	49 (0.87)
O Negative	286	0	5 (1.75)	0	0	0	5 (1.75)
Total	14413	11 (0.076)	116 (0.8)	2 (0.014)	3 (0.02)	0	132 (0.92)
Statistical Significance (SS)		P<0.05 SS	P<0.05 SS	P>0.05 Not SS	P>0.05 Not SS	0	

DISCUSSION

In the present study majority of donors belonged to age group between 18-40 years. Voluntary: Replacement donor ratio is 2.1:1 which is due to motivation and regular blood camps. The Male: Female ratio is 20.4: 1. Lack of motivation, fears, cultural habits, social inhibition, anemia during menstruation, low body weight etc could have prevented the females from blood donation. Hence, Females need to be motivated and made aware of advantages of blood donation.[5]

The most prevalent blood group in Hassan district was O positive group (39.04%) in comparison to earlier studies.[4, 5] Least prevalent blood group was AB negative (0.36%).The frequency was given by (O>B>A>AB) where as it was (B>O>A>AB) in other studies.[4, 5] Prevalence of Rh positive donors (95.32%) was more than Rh negative donors (4.68%).

After screening, 0.92% were found to be positive for one or more diseases compared to 3.48 %, 0.5% and 2.25% respectively in earlier studies. [9, 10, 15] Among the total reactive group, 93.94% were Rh-D positive and remaining 6.06% were Rh-D negative donors. Rh-D negative donors were found to be infected from hepatitis B infection. Prevalence of hepatitis B infection was

more in B negative group (1.86%) when compared to O negative group (1.75%). Sreedhar Babu et al found that among the total HBV and HCV seroreactive group, 93.7% and 93.1% had Rh-D positive blood group and remaining 6.3% and 6.9% had Rh-D negative blood group respectively.[16]

In the present study, prevalence of HIV, HBV, HCV and Syphilis are 11(0.076%), 116(0.8%), 2(0.014%) and 3(0.02%) respectively. This can be compared with earlier studies in which seroprevalence of HIV, HBV, HCV, and syphilis was 0.1%, 0.57%, 0.05%, and 0.05%, respectively.[17] Statistically significant association was found between HIV and Hepatitis B infection with ABO and Rh blood groups (P<0.05). Higher prevalence of HIV, HBV, HCV and Syphilis was found in O positive (0.124%), B negative (1.86%), A positive (0.03%), O positive blood group (0.035%) respectively. Lekha Mandodar et al study showed HIV was seen majorly in B-ve group, HBsAg in A –ve, HCV in B –ve and VDRL in A –ve blood group.[18] There was no statistically significant association between Hepatitis C and syphilis infections with blood groups (P>0.05).This goes in support of earlier studies.[10]

Getaneh Alemu et al studied ABO/Rh Blood group association with asymptomatic Malaria and found that blood group is significantly associated with malaria infection. High rate of parasitemia was seen in O blood group donors compared to other ABO blood groups.[19] However subclinical asymptomatic malaria positive donors were not found in present study. All symptomatic clinical malaria positive donors were excluded from present study.

CONCLUSION

The most prevalent blood group in Hassan district was 'O positive' (39.04%), and least prevalent was AB negative (0.36%). Prevalence of Rh positive donors (95.32%) was more than Rh negative donors (4.68%). A total of 0.92% was found to be positive for one or more diseases. Out of which 93.94% was Rh positive donors and 6.06% were Rh negative. Rh negative donors were found to be positive for hepatitis B infection. Prevalence of HIV, HBV, HCV and VDRL are 11(0.076%), 116(0.8%), 2(0.014%) and 3(0.02%) respectively. Higher prevalence of HIV, HBV, HCV and Syphilis was found in O positive (0.124%), B negative blood group (1.86%), A positive (0.03%) and O positive blood group (0.035%) respectively. The most common Transfusion transmitted infections seen in Hassan district is Hepatitis B infection.

Conflict of Interest – Nil

Source of Funding- Self

Ethical Clearance – Obtained from Institutional Ethical Committee

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Prevalence of Anxiety, Depression and Stress among First Year Undergradute Medical Students

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ABSTRACT

Background: The goal of medical education is to train knowledgeable, competent and professional physicians to care for the nation's sick, advance the science of medicine and promote public health. Medical school can impose significant psychological stress on medical students mainly through time pressure, large amount of new information, excessive working hours and knowing that at the end of their training they will be directly responsible for the health and welfare of others.

Aims and Objectives: To determine the prevalence of anxiety, depression and stress in first year undergraduate medical students in Shimoga.

Materials and Method: A cross-sectional, questionnaire based survey was conducted among 200 First Year MBBS students aged between 18-22 years at SIMS, Shimoga using DASS-42 Scale.

Results: Out of 200 students, about 65% had anxiety, 42% had depression and around 58% were found to be under stress. Female students were 6 times more likely to develop stress.

Conclusion: The challenges to all medical colleges are to promote student well-being and provide students with the coping tools to deal with stress throughout their medical education. They should incorporate more leisure activities in their curriculum, promote better interaction between the students and the faculty, have advisory services and peer group counseling at the campus and instigate rehabilitation programs for victims of anxiety and depression.

Keywords: *Anxiety; Depression; Stress; First year medical students.*

INTRODUCTION

In the more competitive environment that accompanied the increasing industrialization of the 20th century, there has been a widespread increase in stress-related mental disorders. It is estimated that by the year 2020, anxiety and depression will be the second most common cause of disability worldwide. [1]

The goal of medical education is to train knowledgeable, competent and professional physicians to care for the nation's sick, advance the science of medicine and promote public health.[2] Medical school can impose significant psychological stress on medical students mainly through time pressure, large amount of new information, excessive working hours and knowing that at end of their training they will be directly responsible for health and welfare of others.[3]

A considerable degree of psychological morbidity has been reported in medical students ranging from stress, interpersonal problems and suicidal ideation to psychiatric disorders. These reports have given rise to concern on how students' distress can affect their learning, professional development and patient contacts .Psychological problems from medical school stress may predict later mental health problems; students seldom seek help for their problems. [4]

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There is a paucity of such studies in South India. Hence, this study was carried out to see the prevalence of anxiety, depression and stress among first year undergraduate medical students in SIMS, Shimoga.

MATERIALS AND METHOD

The study was carried out among 200 first year undergraduate medical students of SIMS, Shimoga in January –February around five months after the commencement of the course. It was a cross-sectional study which included all First year medical Undergraduate students in the age group of 18-22 years.

Method of collection of data:

1. The study was done after obtaining Institutional Ethical Committee Clearance.

2. Details of the study protocol were explained to all those who volunteered for the study.

3. Informed consent was obtained.

4. The tests were carried out on the students in small batches of 20-30.

5. They were given a questionnaire (DASS 42 Scale) to be filled by themselves individually.

6. The students were explained the aim of the study and the fact that their co-operation in the form of giving honest answers was necessary.

7. Students were also assured that their anonymity would be maintained.

8. Score was noted based on DASS Scoring. [5]

9. Data was expressed in terms of percentage.

Statistical analysis: Statistical analysis was done using SPSS software version 21. p value < 0.05 was considered significant.

RESULTS

200 first year undergraduate medical students aged 18-22 years of whom 120 were males and 80 females were included in the study.Mean age was around 19.5± 1.33. Score was interpreted based on DASS-42 scoring .Prevalence of Anxiety , Depression and Stress among these medical students are shown Table 1.In the study, anxiety was more prevalent (65%) , compared to stress (58%) and depression (42%).

Among those with anxiety, 32% had mild degree of anxiety, 17% had moderate anxiety , 11% had severe anxiety and 5% had extremely severe anxiety (Figure 1).Among those who had depression, 22% had mild depression, 11% had moderate level of depression 7% had severe depression and 2% were found to have extremely severe depression(Figure 2).Among those who were stressed, 16% had mild stress, 21% were moderately stressed, 12% were under severe stress, and 9% were found to be extremely stressed out(Figure 3).

Table 2 shows the gender differences in prevalence of various grades of anxiety, depression and stress. The present study showed that prevalence of anxiety was equal (65%) among both the genders. Table 2 shows 24% of the females were moderately anxious whereas only 12% males had moderate anxiety.

There was no significant gender difference in the prevalence of mild/ severe anxiety. There was no significant difference in the prevalence of depression among males and females. However prevalence of moderate to severe depression was significantly more among females compared to males ($p < 0.05$).

Table 2 shows that prevalence of stress in females was 80%, whereas it was 43% among males. Table 3 shows prevalence of stress was 6 times higher in females compared to their male counter parts ($p <0.0001$). 45% of females were under severe- extremely severe stress compared to 5% in males indicating female medical undergraduate students significantly suffered from severe-extremely severe stress ($p<0.05$).

Table 1: Prevalence of anxiety, depresssion and stress among first year medicl students

	Present		Not Present	
	No. of Partcipants	**Percentage (%)**	**No . of Partcipants**	**Percentage (%)**
Anxiety	130	65	70	35
Depression	84	42	116	58
Stress	116	58	84	42

Table 2: Gender wise distribution of anxiety, depression and stress among first year medical students

	Grades	Males		Females		Total	
		No. of Individuals	%	No. of Individuals	%	No. of Individuals	%
Anxiety	Normal	42	35	28	35	70	35
	Mild	38	31.5	26	32.5	64	32
	Moderate	15	12.5	19	24	34	17
	Severe	17	14	5	6	22	11
	Extremely Severe	8	1	2	2.5	10	5
Depression	Normal	91	76	25	31.2	116	58
	Mild	22	18	22	27.5	44	22
	Moderate	04	3.4	18	22.5	22	11
	Severe	02	1.7	12	15	14	07
	Extremely Severe	01	0.9	03	3.8	04	02
Stress	Normal	68	57	16	20	84	42
	Mild	12	10	20	25	32	16
	Moderate	34	28	08	10	42	21
	Severe	04	03	20	25	24	12
	Extremely Severe	02	02	16	20	18	09

Table 3: Association of gender with stress

	STRESS	NO STRESS	ODDS RATIO VALUE (95% CONFIDENCE INTERVAL)	P-VALUE
FEMALES	64 (80%)	16 (20%)	6.1818 (3.1751 to 12.0359)	P<0.0001 (<0.05) SIGNIFICANT
MALES	52 (43%)	68 (57%)		

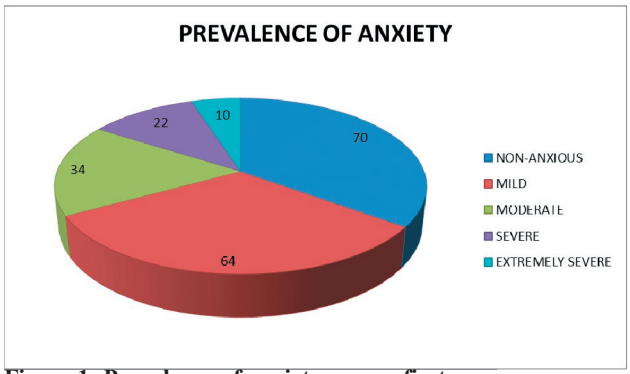

Figure 1: Prevalence of anxiety among first year undergraduate medical students (n=200)

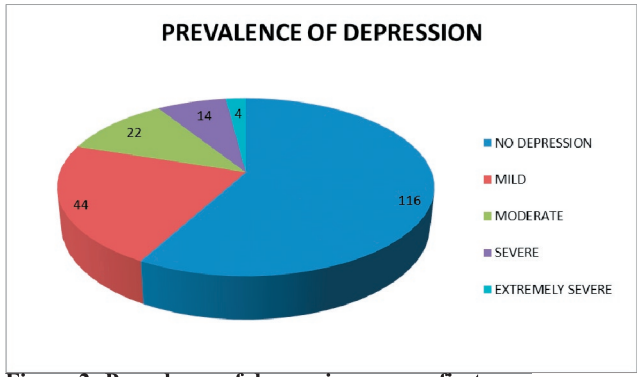

Figure 2: Prevalence of depression among first year undergraduate medical students (n=200)

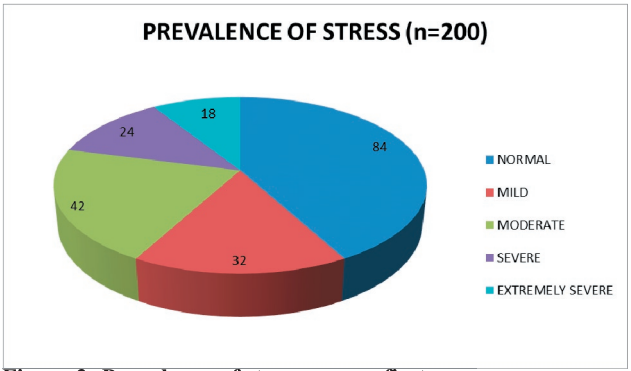

Figure 3: Prevalence of stress among first year undergraduate medical students (n=200)

DISCUSSION

Psychological well-being is important for medical students, for the patients they met and for their future medical practice. Current education process in medical training exposes their students several types of stressors, some are exogenous such as adaptation to medical curriculum, vastness etc. and some are endogenous like gender, personality traits etc. We have used the reliable and valid depression and anxiety screening tool, DASS-42.

A similar cross-sectional study done using DASS 42 questionnaire showed that. More than half of the respondents were affected by depression (51.3%), anxiety (66.9%) and stress (53%). Females reported higher score as compared to their male counterparts. Perception of self assessment in academics was strongly associated with the higher score.[6]

A cross-sectional study carried out on 815 medical students at Nishtar Medical College, Multan showed a high prevalence of anxiety and depression (43.89%) . Prevalence of anxiety and depression among students of first, second, third, fourth and final years was 45.86%, 52.58%, 47.14%, 28.75% and 45.10% respectively. Female students were found to be more depressed than male students (OR = 2.05, 95% CI = 1.42-2.95, p = 0.0001). There was a significant association between the prevalence of anxiety and depression and the respective year of medical college (p = 0.0276).[7]

In a study done on 252 students, prevalence of anxiety and depression in students of 4th year, 3rd year, 2nd year and 1st year was 49%, 47%, 73% and 66% respectively. It was significantly higher in 1st year and 2nd year, as compared to 3rd and 4th year ($p < 0.05$).[8]

Medical students go through not only the stress imposed by medical education but also routine everyday life stressor which may explain the level of severe stress noted among medical students. It was found in our study that females were 6 times more likely to develop stress. The reason may be because in South India most girls are brought up in a conservative environment and once they join the medical school they may end up staying away from home and find it difficult to cope up with the changes around them.

The reasons that can be attributed to the severe stress among 1st year students are large content of the text to be learnt, tests/examinations and no sufficient time to review what has been learnt. These calls for introducing early intervention strategies so that students who are entering in the medical education system can learn to cope with the pressure induced by medical education timely.

Interaction between students and faculties should be encouraged so that the signs of stress, anxiety and depression can be detected and addressed at the earliest. Prevention strategies should take into consideration the wide variety of factors that are inducing stress, depression or anxiety among students. Adding electives can also allow flexible learning options in the curriculum and may offer a variety of options including clinical electives, laboratory postings or community exposure in areas that students are not normally exposed as a part of regular curriculum. This will also provide opportunity for students to do project, enhance self directed learning, critical thinking and research abilities.

It is possible that few students have already an inherent tendency of taking stress and being anxious at their entry in M.B.B.S course may be aggravating it. Such students should be identified by psychological screening tests at the time of their entry only. Recreation facilities should be provided within the campus for the students as it is proved that inadequate social activity and impaired psychological health are interlinked and also that leisure activities can reduce stress among students. Relaxing exercises, yoga and meditation should be studied to relieve stress among medical students

CONCLUSION

This study has found that majority of First year undergraduate medical students experience stress. Proper guidance and counseling by faculties may help

to improve the present scenario. A physician is like a flower in the society. For spreading its fragrance into the society, it needs to be nurtured healthily providing a sound mental built up from the curricular activities supported adequately by their families.

LIMITATIONS

Lack of generalization of our results to other medical schools in India is an important limitation of this study. As it is a questionnaire based study, reporting bias can't be eliminated. This study was restricted to only one medical college. The sample size was small and unequal. Further studies taking large and proportionate sample size would minimize bias.

The study was done only in first year medical students and did not involve the students of other phases. The main reasons that surfaced were the sensitive and personal nature of the study as well as the length of questionnaire.

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A Comparative Study of Cognitive Functions in Occupational and Recreational Computer Users

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ABSTRACT

Background: Computers have become an integral part of our modern world. Computer use is an interactive activity. Participation in cognitively challenging activities is associated with higher level of cognitive performance. However, effect of computer use on cognitive function is not well understood. Hence this study was taken up to evaluate the effect of occupational computer use on cognition.

Methodology: A total of 50 occupational (using computer for work for >40hrs/week) and 50 recreational (<15hrs/week) computer users who were graduates in the age group of 21-35yrs were tested for 'Mental Speed' by Digit Symbol Substitution Test (DSST), 'Sustained Attention' by Digit Vigilance Test (DVT), 'Response Inhibition' by Stroop Test and 'Learning & Memory' by Auditory Verbal Learning Test (AVLT) & Complex Figure Test (CFT).

Results: Results were statistically analysed using student 't' test. Occupational computer users performed better than the controls in DSST (p=0.041), DVT (p=0.027), Stroop Test (p=0.004) and Complex Figure Test (p=0.02) which were statistically significant. However, no statistically significant difference was observed in AVLT between the two groups.

Conclusion: Occupational computer users have better mental speed, sustained attention, response inhibition and visual memory compared to recreational computer users.

Keywords: *Cognition, Occupation, Recreational, Computer Use.*

INTRODUCTION

Computers have become an integral part of our modern world[1]. It is being used in every aspect of life from calculating grocery bills, banking operations, telecommunications, IT field, education & medical care[2]. However along with its benefits, it is associated with visual fatigue, musculoskeletal disorders, stress and decreased sleep due to their time bound work[3, 4]. Computer related morbidity has become an important occupational health problem[2].

The concept of cognition (from the Latin word cognoscere, "to know" or "to recognize") refers to the capacity for information processing, applying knowledge and changing preferences. Cognition involves memory, attention, executive functions, perception, language and psycho-motor functions[5]. Several studies have suggested that engaging in cognitively challenging activities, such as reading books or newspapers, playing games, making crossword puzzles and listening to music, is associated with maintenance or even improvement of cognitive skills[6].

Some studies have shown that greater use of computer will be associated with higher levels of cognitive performance[1]. Whether adults with better cognitive abilities tend to use the computer more (due to socio-economic status/occupation, better computer attitudes or other factors) or the computer use helps to maintain or improve cognitive abilities, is still unclear[7]. Few studies have also shown that computer use has no effect on cognitive function[8].

To date, only a limited number of studies have actually focused on the impact of computer use on cognitive functions. Hence this study was undertaken, to evaluate the effect of occupational computer use

on cognition and to settle down the contrary results in previous studies.

MATERIAL AND METHOD

Study was conducted on computer users in Bangalore after obtaining clearance from the Institutional Ethical Committee. Study was carried out between April and June 2016. Informed written consent was obtained from every subject after explaining the study protocol. 100 computer users in the age group of 21–35 years who were graduates were selected for the study according to the eligibility criteria.

A detailed history taking and relevant clinical examination was done for all subjects. Following which, subjects who had BMI > 30kg/m^2, Perceived Stress Scale Score > 13, Pittsburgh Sleep Quality Index Score 5 were excluded from the study. Also, individuals with diabetes mellitus, hypertension, psychiatric illness, neurological disorders, smoking, alcohol intake or any substance abuse were not taken up for the study. Subjects receiving medications like sedatives and hypnotics were also excluded. Of the 100 participants, 50 were **occupational computer users** who used computer for work for >40hrs/week and 50 were **recreational computer users** who used computer for <15hrs/week for recreational purposes. In this modern era of technology, since it is difficult to get a non-user of computer, recreational computer users were chosen as the control group.

Cognitive Function Tests were administered according to the instructions provided in the NIMHANS Neuropsychology Battery[9]. Time taken for test was noted with the help of a stopwatch. Following tests were administered in a fixed order during a single session in a quiet room for all participants:-

Domain	Function	Test
Speed	Mental Speed	Digit Symbol Substitution Test (DSST)
Attention	Sustained Attention	Digit Vigilance Test (DVT)
Executive Functions	Response Inhibition	Stroop Test
Learning & Memory	Verbal	Auditory Verbal Learning Test (AVLT)
Learning & Memory	Visual	Complex Figure Test

Digit Symbol Substitution Test: DSST consists of a sheet in which numbers 1–9 are randomly arranged in 4 rows of 25 squares each. Subject substitutes each number with a symbol using a number-symbol key given on top of the page. First 10 squares are for practice. Time taken to complete the test forms the score. Lower score indicates better mental speed.

Digit Vigilance Test: DVT consists of numbers 1–9 randomly ordered and placed in rows on a page. There are 30 digits per row and 50 rows on the sheet. Digits are closely packed on the sheet. Subject has to cancel the digits, 6 and 9 as fast as possible without missing the targets or cancelling wrong numbers. Time taken to complete the test forms the score. Lower score indicates better sustained attention.

Stroop Test: Colour names Blue, Green, Red and Yellow are printed in capital letters on a paper. Colour of the print occasionally corresponds with the colour designated by the word. Words are printed in 16 rows and 11 columns. Subject was asked to read the words column-wise as fast as possible. Time taken to read all the 11 columns were noted down. Next, the subject was asked to name the colour in which the word was printed. The time taken to name all the colours in column wise was noted down. *Reading time* and *naming time* were converted into seconds. Reading time was subtracted from the naming time to get the Stroop effect score. Lower score indicates better executive function.

Auditory Verbal Learning Test: AVLT consists of words designating familiar objects like the vehicles, tools, animals and body parts. There are two lists A and B, with 15 words in each list. Words in list A were presented at rate of 1 word per second in the same order for 5 trials. Each trial consisted of the presentation of all 15 words, immediately followed by the recall of the same by the subject. Response was noted down. After the completion of 5 trials of List A, words in List B were

presented once and an immediate recall was taken for the same. Presentation of List B serves as interference. This was followed by *immediate recall* of words from List A. After a delay of 20 min, words from List A were again recalled to form the *delayed recall* score. Following delayed recall, *recognition trial* was done in which, 30 words [15 words from List A & 15 new words were randomly mixed] were called out one at a time and the subject indicated whether each word belonged to list A or not. Hits and errors were recorded. Total number of words correctly recalled over 5 trials form the L*earning Score*. Number of words recalled correctly in immediate recall trial, delayed recall trial and recognition trial form the *Memory Score.*

Complex Figure Test: An 8.5 inch by 11 inch card containing complex figure and a paper of same size is placed in front of subject. Subject has to copy the figure on the paper without using rulers; erasers may be used. Then, the subject is asked to recall the figure twice – 3 minutes after copying *(Immediate Recall)* and 30 minutes later *(Delayed Recall)*. A score of 0, 0.5, 1 or 2 was assigned to each unit of figure based on the accuracy and placement criteria; total score was calculated.

Statistical Analysis: Data presented as mean ± standard deviation. Independent Student's t-test (two tailed) was used to compare the two groups. P-value < 0.05 was considered statistically significant. LibreOffice Calc was used for statistical analysis and to generate tables and graphs.

RESULTS

Table 1 shows demographic details of both the groups. Both the groups were age, BMI and gender matched.

Table 1: Demographic Details

	Occupational Computer Users	**Recreational Computer Users**	**P-Value**
Age (yrs)	28.1 ± 3.76	27.08 ± 3.26	0.151
BMI (Kg/m^2)	23.12 ± 1.8	23.75 ± 1.98	0.096
Males	27	23	
Females	23	27	

Table 2 shows mean ± SD values of the scores of different tests for both the groups. It was observed that occupational computer users performed better in DSST, DVT, Stroop Test and Complex Figure Test which was statistically significant. However, no statistically significant difference was observed for AVLT score between the two groups.

Table 2: Scores of different tests of both the groups

	Occupational Computer Users	**Recreational Computer Users**	**P-Value**
DSST Score	159.32 ± 13.37	164.28 ± 10.39	**0.041***
DVT Score	371.02 ± 18.39	378.88 ± 16.47	**0.027***
Stroop Score	92.82 ± 5.78	96.74 ± 7.35	**0.004***
AVLT – Learning Score	62.16 ± 3.59	60.9 ± 5.64	0.186
AVLT – Memory Score	44.04 ± 3.63	44.72 ± 2.79	0.296
CFT – Copy	35.08 ± 1.1	34.76 ± 1.42	0.212
CFT – Immediate Recall	26.2 ± 2.06	24.99 ± 2.98	**0.02***
CFT – Delayed Recall	25.83 ± 2.53	24.52 ± 3.03	**0.021***

DISCUSSION

The present study reveals that occupational computer users have better mental speed, sustained attention, response inhibition and visual memory compared to recreational computer users. 'Mental Speed' requires rapid processing of information which in-turn requires coordination of different areas of brain. 'Sustained Attention' refers to the capacity to attend a task for a required period of time. Right fronto parietal network mediates sustained attention. 'Response Inhibition' measures the ease with which a perceptual set can be shifted both to conjoin changing demands and by suppressing a habitual response in favour of an unusual one. Pre-frontal areas are essential for response inhibition. 'Verbal / Visual Learning and Memory' is the capacity to learn and remember verbal / visual material[9].

Computer use requires continuous inputs from the users and therefore provides mental stimulation. Computer use is an interactive activity which requires visuomotor control in their operation: visual-cognitive input (i.e., viewing a screen) and manual output (i.e., manipulation of peripheral devices such as a keyboard and mouse) [10].

Procedural memory is required to activate the routines that are necessary to use a computer program, e.g. to launch a Web browser, and to execute specific commands in that browser. To keep track of information already processed or to decide on the next action to take, working memory is required. Executive functions come into play when strategies are made to perform a task efficiently. Visual search, information processing and attention processes are recruited in order to find relevant cues, to evaluate which information is relevant within a given context, and to focus on those cues while ignoring or inhibiting irrelevant cues[6]. Therefore, it is possible that having and maintaining a job that involves a computer also requires more mental activities such as organizing and multi-tasking[1].

Researches have shown that structural differences emerge in brain, when exposed to divergent sensory experience. So the external conditions can transform the course of brain development. This phenomenon is referred as neural plasticity[11]. Computer experience is associated with altered neural activation in frontal regions which are consistent with the computer's demands on multitasking, involving shifting of attention and interactive coordination of motor, sensory and cognitive skills. Thus coordinating and scheduling all of these component activities may help to maintain good cognitive function[1]. And this cognitively stimulating activity may enhance functional connections contributing to cognitive reserve[12].

Findings in the present study are consistent with the results from a study done by Patricia A.Tun et al in 2010. They found that frequent computer activity is associated with good cognitive function particularly executive control[1]. Slegers K et al in 2012 also reported similar findings. Their study was quiet similar to ours in terms of tests used. They used Visual Verbal Learning Test to measure verbal memory, Letter–Digit Substitution Test to measure processing speed and Stroop Colour Word Test for selective attention and susceptibility to interference. They also found protective effects of the computer use for measures of selective attention and memory in both older (>50yrs) and younger (24-49yrs) participants[6]. But contrary to above results, Slegers K et al in 2009 observed that learning to use a computer, does not benefit older adults with respect to many domains of cognitive functions[8]. It could be because, it was an intervention study in which participants used computer for 1 year and just 1 year of computer use may not be enough to cause changes in cognitive functions. Also, in our study, computer use was self-initiated, while in intervention studies participants are asked to use computer. As a result, individuals might have differed in their motivation to use computers.

There were few limitations in the present study. Larger and more diverse population including varied age groups should have been more representative of the population. Longitudinal studies are required to examine the causal mechanisms in the relationship between cognitive performance and computer use. Further research using functional MRI can provide better insight into the mechanisms.

CONCLUSION

Computer use has positive effects on cognition. Computer use may be one of the easily accessible activity that helps to remain mentally active. Computers are useful tools which should be suitably & thoughtfully integrated within the educational system. Computer use can be promoted to lessen the chances of developing cognitive impairments like Alzheimer's disease and age-

related cognitive decline.

Conflict of Interest: Nil

Source of Funding: Self

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Alterations in the Vascular Physiology of Young Adults with Family History of Type 2 Diabetes Mellitus

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) is a leading cause of morbidity and mortality, particularly from cardiovascular diseases. Family history of diabetes appears to increase the risk of coronary artery disease (CAD), even in non-diabetic subjects. They are insulin resistant and carry a risk of premature atherosclerosis, the extent of which can be estimated by measuring the carotid artery intima media thickness (CIMT).

Aim & objectives: To compare the CIMT in offsprings with (FH^+) of T2DM and offsprings without (FH^-) of T2DM. Subjects in both groups are apparently healthy individuals with no known cardiovascular risk factors.

Method: We studied 69 young (18-25 years), adult offsprings with (FH^+) of T2DM and 50 control subjects without (FH^-) of T2DM (age, sex, BMI and blood pressure matched). A FH^+ of T2DM was defined as having one or both parents with type 2 diabetes. All subjects underwent high resolution B-mode ultrasonographic evaluation of common carotid artery intima–media thickness. Plasma glucose and lipid profile were measured after an overnight fast of 10-12 hours.

Results: Compared to controls, subjects with FH^+ had increased CIMT, (0.46 mm ± 0.01 Vs 0.56 mm ± 0.01, $P<0{\cdot}001$). Metabolic parameters were within normal limits and there was no statistical difference among both groups. Pearson's correlation established a significant and stronger association between CIMT and metabolic variables (fasting blood glucose, triglycerides and very low density lipoprotein cholesterol) only among FH^+ subjects.

Conclusion: These results suggest that a genetic predisposition to T2DM may accelerate the development of atherosclerosis and increase the risk for CHD.

Keywords: *Type 2 diabetes mellitus, coronary heart disease, carotid artery intima media thickness, blood glucose.*

INTRODUCTION

It is well established that type 2 diabetes mellitus (T2DM) is a leading cause of morbidity and mortality, particularly from cardiovascular disease. The risk of heart disease increases even in non-diabetic subjects with family history of T2DM. They approximately have a 40% life time risk of developing T2DM[1]. Though, present life style with excess calorie dense food and limited physical activities are attributed for the development of T2DM, a genetic predisposition seems to be an important trigger in initiating the metabolic dysregulation that leads to the development of T2DM[2]. Subjects with family history of T2DM are often insulin resistant and carry a risk of premature atherosclerosis. Measurement of carotid artery intima media thickness (CIMT) by high resolution ultrasonography is being

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used as an approved surrogate marker for subclinical atherosclerosis[3], since it is an excellent non-invasive marker of generalized atherosclerosis. There are many reports that suggested that the carotid and cerebral arteries and the aorta undergo the atherosclerosis at the same age as the coronary arteries[4]. It is also a strong predictor of future cardiovascular events[5]. Hence, a family history of diabetes, even in non-diabetics subjects without any cardiovascular disease risk factors, is regarded as an increased coronary heart disease risk. Carotid ultrasonic measurements can be an important early atherosclerosis marker. The objective of this study is to analyse the structural characters of the carotid arteries in subjects with and without a family history of T2DM, both groups with no other known cardiovascular risk factors.

MATERIALS AND METHOD

Research design & subjects

In this cross-sectional study, we studied a total of 103 subjects between the ages of 18-25 years of both sexes. Among which 69 were cases with positive family history of T2DM and 34 were controls with negative family history for T2DM. Few control subjects included in the present study were the same in whom we investigated the effects of family history of coronary artery disease on carotid intima media thickness[6]. A positive family history of T2DM was defined as having one or both parents with T2DM and a negative family history of T2DM was defined as having either parents or relatives up to third generation without T2DM. Cases were recruited among the offsprings of patients who visited the Diabetic clinic and controls were subjects who visited the same hospital for physical fitness certificates prior to employment. The study was done in the Department of Physiology in conjunction with the Department of General Medicine and Radiodiagnosis at SRM Medical College, Hospital and Research Centre, kattankulathur, India for a total duration of 22 months from August 2014 till May 2016. To reduce the effect of other confounding factors we excluded subjects with smoking history, alcohol intake, coronary artery anomaly, arrhythmia, heart failure, stroke, transient ischaemic attack, obesity, who are already being treated for CAD/diabetes and/ anaemia, hepatic and other chronic illness that might affect glucose homeostasis and endothelial function. Thus participants in both groups were metabolically well defined individuals with no other known cardiovascular risk factors other than family history of T2DM in cases.

Ethics statement:

The study was initiated after obtaining approval from the institutional ethics committee (659/IEC/2014) and conducted in accordance with the Declaration of Helsinki, including written informed consent from each participant.

Blood pressure and anthropometric measurements:

All those who agreed to participate were given a questionnaire to obtain information on smoking, alcohol consumption, history of diabetes, hypertension, family history of vascular disease and diabetes. Each subject underwent a detailed clinical examination and BMI was calculated after measuring anthropometric variables like height and weight according to standardized protocols[7]. Blood pressure was measured as a mean of three readings taken at 2 minutes interval using a periodically calibrated mercury sphygmomanometer[8].

Sample collection and blood investigations:

Fasting venous blood samples were collected between 8-10 am in the morning after 10-12 hours of fasting to estimate blood sugar levels and lipid profile. Blood glucose levels were estimated by the glucose oxidase method[9]. Lipid profile included measurement of total cholesterol (TC), triglyceride (TG), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) and very low-density lipoprotein (VLDL-C) cholesterol using standardized commercially available SIEMENS kit[8]. Serum LDL-C and VLDL-C were calculated from the estimated values of TC, TG and HDL-C, using Frieldwald's equation[10].

Ultrasonography measurements:

CIMT was measured with high resolution ultrasound of the right and left carotid arteries using PHILIPS HD 7 ultrasound machine with L12-3 broadband linear probe. The study protocol involved scanning the bilateral cervical carotid arteries in cross section to see the luminal patency and for the presence of plaques in the longest extension possible from the base of the neck to the carotid bulb and bifurcation. Then longitudinal images were obtained and the distance between the far two echogenic lines representing the intima media thickness

(IMT) of the arterial wall of the distal common carotid artery (CCA) was measured within 1 cm proximal to the carotid bulb. The maximal IMT at this site in the right and left CCAs was measured by manual technique using electronic callipers[11]. The lumen diameter between the near and far wall intima media interfaces was imaged at this site on both sides. All measurements were made by a single trained radiologist who was unaware of the subjects' status.

STATISTICAL ANALYSIS

Data were analysed by using Microsoft excel and statistical software SPSS version 21.0. Descriptive statistics such as mean & standard deviation were used to describe the continuous variables and frequency & percentages were used to describe the categorical variables. Inferential statistics such as Independent T test was used to analyse the difference in the means between the groups. Pearson correlation was used to find out the correlation between continuous variables. P value less than 0.05 was considered to be statistically significant.

FINDINGS

The data on anthropometric and clinical characteristics of our study subjects is presented in table 1. Our data shows that there is no difference in the mean value between both groups, thus making them comparable. Also the BMI and other clinical characters like blood pressure and its derivatives were within normal limits in both groups, indicating our subjects to be apparently healthy individuals. As expected, from table 2 it is evident that there was no significant difference among both groups with respect to blood glucose and lipid profile.

Table 3 summarizes the ultrasonographic findings of the carotids. Subjects with a positive family history of T2DM had greater intima media thickness (right, left and average IMT) compared to those with a negative family history. No difference was observed for carotid lumen diameter.

Table 4 shows the results of the logistic regression analyses of CIMT(dependent variable) and metabolic parameters like fasting blood glucose and lipid profile among our study subjects (n=103). It is observed that mean CIMT was significantly associated with FBS, TG and VLDL cholesterol. When we did subgroup analyses we noted a significant and stronger association between CIMT and metabolic variables (FBS, TG and VLDL) only among those with a positive family history of T2DM (Table 5).

DISCUSSION

It is a well-established fact that genetic predisposition to type 2 diabetes is associated with higher risk of coronary artery disease (CAD). Many authors have shown an increased CIMT values in diabetic individuals compared to non-diabetic controls[12]. Also a positive relation was found between duration of diabetes and CIMT[13]. Mohan et al[14] in their study showed a linear increase in mean CIMT values with increased post prandial blood glucose level, corroborating a greater damage to the vessel wall. However, a similar observation among young adults with genetic predisposition to T2DM is very scarce.

To the best of our knowledge this is the first Indian study reporting observations with regards to heritability of CIMT. Our results show that healthy, young offspring of parents with T2DM have significantly increased CIMT compared with the offspring of non-diabetic parents (Table 2). Statistical significance is retained even after adjustment for a range of confounders, suggesting an independent association between CIMT and family history of diabetes (Table 4 & 5). Thickness of the intima-media complex in large vessels is the first evidence of atherosclerosis at subclinical stage. A closer look at the chronology of atherosclerosis- the first to set in is endothelial dysfunction, followed by increase in intima-media thickness. Thus an increased CIMT in our study suggest the possibility of accelerated atherosclerosis at subclinical stage and these individuals though apparently healthy are at greater risk of CAD compared to controls. Pannacciulli et al[15] demonstrated higher CIMT in young normal, overweight and obese glucose tolerant offsprings of T2DM patients compared with control subjects. Balletshofer et al[16] established association between endothelial dysfunction and insulin resistance in young normotensive offsprings of diabetic subjects independent cardiovascular risk factors. The mechanism behind a raised CIMT in healthy offspring is still unclear. As mentioned earlier endothelial dysfunction plays a central role in the development of atherosclerosis- a disturbed endothelium dependent vasodilation is regarded as an early marker in the development of vascular disease and this occurs even before hyperglycemia becomes evident[17]. These vascular

derangements are believed to ensue at an early and faster pace in individuals with a genetic predisposition explaining the raised CIMT in our study population. The reason for such vascular derangements in people with family history of diabetes is still a topic of debate, however few studies point towards a link between decreased endothelium released nitric oxide production in susceptible population[18, 19]. Thus genetics along with the interplay of environmental factors, urbanization and detrimental lifestyle poses a higher risk of CAD for such individuals. Our study has some limitations; we were not able to match the cases and controls, as it was extremely difficult to recruit control subjects having either parents or relatives up to third generation without history of T2DM. Also, we only quantified the anatomical abnormalities of the vessel wall and did not assess the functional characters of the blood vessel.

Table: 1 Anthropometric & clinical characteristics of (FH^+) and (FH^-) subjects

Parameters	Positive family history (FH^+)	Negative family history (FH^-)
Mean age(yrs)	22.57 ± 0.52	23.64 ± 0.96
Male (%)	42/69 – 60.9	15/34 – 44.1
Mean Weight (kgs)	62.75 ± 1.38	60.42 ± 1.63
Mean Height (cms)	165.71 ± 1.20	165.33 ± 1.81
Mean BMI (kg/m^2)	22.80 ± 0.40	22.08 ± 0.45
Mean SBP (mm Hg)	109.32 ± 1.42	107.88 ± 1.93
Mean DBP (mm Hg)	72.59 ± 1.04	72.48 ± 1.62
MAP (mm Hg)	83.66	83
PR/min	74	77

BMI- Body mass index, SBP- Systolic blood pressure, DBP- Diastolic blood pressure, MAP- Mean arterial pressure, PR- Pulse rate

Table: 2 Ultrasonographic characters of blood vessel in study subjects

Parameters	Positive family history (FH^+)	Negative family history (FH^-)	T value	P value
CIMT- Right(mm)	0.56 ± 0.01	0.46 ± 0.01	5.814	0.0001*
CIMT- Left(mm)	0.57 ± 0.01	0.47 ± 0.01	6.888	0.0001*
CIMT- Average(mm)	0.56 ± 0.01	0.46 ± 0.01	7.154	0.0001*
Lumen diameter-Right(cm)	0.57 ± 0.00	0.57 ± 0.01	-0.272	0.786
Lumen diameter-Left(cm)	0.57 ± 0.00	0.56 ± 0.01	0.620	0.537
Lumen diameter-Average(cm)	0.57 ± 0.00	0.57 ± 0.01	0.197	0.844

CIMT- Carotid artery intima media thickness , *- Statistically significant

Table: 3 Biochemical profile of study subjects

Parameters	Positive family history (FH^+)	Negative family history (FH^-)	T value	P value
FBS(mg/dl)	83.35 ± 1.07	80.94 ± 1.58	1.281	0.203
TGL(mg/dl)	115.53 ± 3.94	107.03 ± 5.12	1.270	0.207
Total cholesterol(mg/dl)	133.40 ± 4.07	117.21 ± 4.11	2.487	0.015
LDL(mg/dl)	73.92 ± 4.18	53.75 ± 4.31	3.003	0.003
HDL(mg/dl)	36.37 ± 1.13	42.06 ± 1.61	-2.885	0.005
VLDL(mg/dl)	23.11 ± 0.79	21.41 ± 1.02	1.270	0.207

FBS- Fasting blood sugar, TGL- Triglycerides, TC- Total cholesterol, LDL- Low density lipoprotein, HDL- High density lipoprotein, VLDL- Very low density lipoprotein

Table: 4: Simple correlations between the CIMT and metabolic parameters in the study subjects (n= 103)

Parameters	Average CIMT	
	Correlation coefficient	P value
FBS(mg/dl)	0.267	0.007*
TGL(mg/dl)	0.263	0.008*
Total cholesterol(mg/dl)	0.247	0.013
LDL(mg/dl)	0.221	0.026
HDL(mg/dl)	-0.121	0.229
VLDL(mg/dl)	0.263	0.008*

FBS- Fasting blood sugar, TGL- Triglycerides, TC- Total cholesterol, LDL- Low density lipoprotein, HDL- High density lipoprotein, VLDL- Very low density lipoprotein,

*-Statistically significant

Table: 5 Simple correlations between the CIMT and metabolic parameters in (FH^+) & (FH^-) subjects

Parameters	Average CIMT			
	Positive family history (FH^+)		Negative family history (FH^-)	
	r value	P value	r value	P value
FBS(mg/dl)	0.223	0.007*	0.238	0.183
TGL(mg/dl)	0.215	0.002*	-0.105	0.562
Total cholesterol(mg/dl)	0.196	0.109	-0.232	0.194
LDL(mg/dl)	0.105	0.392	-0.152	0.398
HDL(mg/dl)	0.096	0.434	-0.119	0.511
VLDL(mg/dl)	0.205	0.001*	-0.105	0.562

FBS- Fasting blood sugar, TGL- Triglycerides, TC- Total cholesterol, LDL- Low density lipoprotein, HDL- High density lipoprotein, VLDL- Very low density lipoprotein

*- Statistically significant

CONCLUSION

Healthy, young individuals with family history of T2DM have increased CIMT (sub-clinical atherosclerosis) compared to family history negative controls. Thus these individuals, though apparently normal are at greater risk of CAD. Routine screening of such individuals with a quick, non-invasive ultrasound scan of carotid artery for intima-media thickness will go a long way in prolonging survival and improving quality of life by detecting and appropriate management of subclinical atherosclerosis at early stages.

Conflict of Interest: None

Source of Funding: Self- funded project

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Comparative Trends in Body Mass Index (BMI), in First Year Medical Students, in a Gap of Ten Years

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ABSTRACT

Background & Objectives: Worldwide obesity has more than doubled since 1980. A large number of studies have explored the relationship between Body Mass Index (BMI) and mortality. Objective of this study was to screen out the overweight and obese category in present students and to evaluate the changing trends in a gap of ten years.

Method: Total participants (17-20 years of age) were divided into two groups of 400 each& were categorized into BMI based, normal ,overweight and obese groups.

Results : In the last four years about 43% students were overweight and obese while ten years ago data showed 21% students in these categories.

Interpretation & Conclusion: Comparing both the groups , it can be concluded that, a significant increase in overweight and obese category of students over a period of ten years is observed.

Keywords : *body mass index,overweight, obese.*

INTRODUCTION

Overweight and obesity i.e abnormal or excessive fat accumulation, in childhood, adolescence and adulthood is an increasing problem in many countries. Body Mass Index (BMI) as defined by World Health Organization in fact sheet updated in january, 2015- is a simple index of weight for height that is commonly used to classify overweight and obesity in adults. Worldwide obesity has more than doubled since 1980. A large number of studies have explored the relationship between Body Mass Index (BMI) and mortality, but in most of the studies, height and weight have been measured in adults[12]. As a consequence knowledge is limited about connection between obesity in adolesence and later mortality. It is known that obesity in adolescence also has other negative effects [3,4,5]. Adolescent obesity has been shown to be associated with early maturation, increased truncal deposition of fat [6,7]. It has lasting social effects on self esteem and body image [5,7,8]. Obesity in childhood/ adolescence also seems to be an important predictor of adult obesity, although research that includes long-term follow-up data is lacking [9,10].

BMI is not a perfect measure of adiposity in adolescents, but it has been shown to be a valid measure of fatness in adolescent[11]. In addition, a workshop on childhood obesity convened by the International Obesity Task Force in 1997 concluded that BMI offers a reasonable measure of fatness in children and adolescents[12]. Since height and weight measurements are simple and inexpensive to collect and often have been a routine part of health examinations, BMI can be calculated in many epidemiologic studies. On the basis of a proposal from the International Obesity Task Force workshop, Cole et al. proposed age- and sex-specific cutoff points to define overweight and obesity in adolescents. These cutoff points were linked to the adult categories for overweight (BMI, 25–30) and obesity (BMI >30) and may be used in international comparisons of the prevalence of overweight and obesity [13,14].

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OBJECTIVES

- To screen out the overweight and obese category in present students of recent four years (2010-2013)and (2001-2004)

- To evaluate the changing trends in a gap of ten years.

MATERIAL & METHOD

- Present study was conducted on 800 subjects, first year medical students ,17-20 years of age of recent four years (2010-2013)and four years of (2001-2004).

- Total subjects were divided into two groups of 400 each. group-1 (2001-2004), group-2 (2010-2013).

- Anthropometric parameters height and weight were measured objectively with a calibrated scale.

- BMI or 'QUETELET - INDEX' was calculated as a ratio of weight (in kilograms)to height (in meters)squared.

- BMI= mass(kg)/height(m)^2.

BMI PRIME, a simple modification of BMI system was derived. It is the ratio of actual BMI to upper limit BMI (currently defined at BMI 25).

WHO CATEGORIES OF BMI

Table-1: Observation & Results Percentage of subjects under different categories of Body mass index are as shown in table 2.

Weight classification	BMI range (kg/m2)	BMI PRIME
Underweight	<18.5	<0.74
Normal	18.5-24.9	0.74-1.0
Overweight	25.0 – 29.9	1-1.2
Obese	>30.0	>1.2

Table-2

Body Mass Index (BMI)	Group A					Group B				
	2001	2002	2003	2004	Mean±sd	2010	2011	2012	2013	Mean±sd
<18.5 : Under weight	13	20	12	14	14.75±3.59	13	15	14	12	13.5±1.29
18.5-24.9: Normal	62	68	69	58	64.25±5.19	39	45	44	46	43.5±3.11
25.0-29.9: Over weight	16	5	13	19	13.25±6.02	8	22	29	27	21.5±9.47
>30 : Obese	9	7	6	9	7.75±1.50	40	18	13	15	21.5±12.5

DISCUSSION AND CONCLUSION

- Comparing groups A & B inTable-2 ,it can be concluded that there is a significant increase in overweight and obese category of students over a period of ten years.

- In the last four years about 43% students are overweight and obese while ten years ago data shows 21% students in these categories.

- BMI PRIME was derived individually to make them aware by what percentage their weight deviated from their upper weight limits.

- Nutritional problem in India is gradually shifting from undernourishment to obesity [15]. It is a condition, which has evolved with the advent of civilization, sedentary life style and high calorie diet [16]. Obesity is one of the causative factors for multiple co-morbid conditions leading to metabolic and cardiac disorders [17]. Growing number of evidences indicate association of obesity and sudden cardiac deaths [18,19].

- Students have been motivated to follow lifestyle

management to take care of their weight problem taking into consideration the various health issues associated and risk of developing a number of diseases**.**

Ethical Clearance: Approval by Institutional Ethics Committee.

Source of Funding: Self

Conflict of Interest: Nil

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Prediction Equations for Spirometry in Indian Population of Elderly Two (Male & Female) Group

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ABSTRACT

Aims and Objectives:- To establish numerical norms of cardio-respiratory functions and collect substantial amount of data relating to physical fitness in elderly peoples. The spirometer consists of a vessel placed inverted like a bell in jacket of water. A wide air passage through the Centre of the jacket communicates with the bell. The other end of the passage is connected through a corrugated impervious tubing to a mouth piece; when the subject breaths out through it, the expired air lifts the bell. A counter weight attached to a wire over a pully, balances the weight of the bell, and a pointer records the volume contained in the spirometer. The scale is marked on a wheel fixed over the pully.

Method:- The present study "The Cardiorespiratory Function Tests" was conducted on a randomly selected 110 apparently healthy subjects of 60 years and above age group belonging to both the sexes at Agra. The survey was conducted under the joint auspices of Department of Physiology and Department of Cardiology, S.N. Medical College, Agra.

Result:- In elderly man (60+) mean the average vital capacity (V.C) was 2334.3 ± 370.3 ml and in elderly women (60+) 2206.2 ± 297.5 ml.

Conclusion:- The prediction equations have been developed for spirometry variables in elderly group of Indian origin using the current ATS/ERS spirometry standardisation recommendations. The equations suggest an improvement in the lung health of the population over time in the middle-aged and the elderly. These equations should address a long-felt unmet need and enable a more appropriate evaluation of spirometry data in different chest diseases in Indian subjects. It can be applied clinically for improving balance in elderly population.

Keyword:- *Spirometer, Male & Female, elderly population, Indian.*

INTRODUCTION

Spirometry is a highly informative and by far the most commonly performed investigation to evaluate pulmonary function in patients with chest diseases. The technical aspects of equipment and test performance require a very meticulous attention to quality control and these have been well-standardised and revised from time-to-time. The most recent recommendations on standardisation were jointly formulated by the task force of the American Thoracic Society (ATS) and the European Respiratory Society (ERS) in 2005[1]. A few studies from different parts of India have reported prediction equations for spirometry over the last few decades.

6-9,12-14 These studies have varied in study population, sample size, instrumentation and statistical techniques used and may no longer be useful as these were carried out with equipment and measurement protocols that have since changed. Their current utility and validity are further questionable considering the evidence of a cohort effect that shows improvement in the lung health of a population over a long-term[2,3,4,5].

Thus, there is clearly an urgent need to develop these equations afresh for different regions of the country using current standardisation protocols recommended by the ATS-ERS[6,7].

Lack of locally relevant and valid prediction

equations is a widely felt unmet need in the field of pulmonary medicine in India hampering interpretation of data and patient management[1].

Therefore, we carried out a study to develop and validate prediction equations for spirometry in adults of north Indian origin. This was part of a larger multi-centric exercise supported by the Indian Council of Medical Research to develop prediction equations for lung function parameters for different regions of the country. Spirometry was carried out according to the 2005 recommendations of the ATS-ERS[1].

A non-heated Fleisch Pneumotach Spirometer (KOKO, nSpire, UK) was used with a filter and a re-usable sterile mouthpiece with side flanges to avoid any leakage. The spirometer was calibrated daily using a 1-L syringe according to the manufacturer's recommendations. The breathing procedure was explained and a demonstration of the test was given. In addition, the next subject to be tested was asked to sit nearby and watch. The manoeuvers were performed in the sitting position with a nose-clip applied. Tight clothing around the neck was loosened[1].

The role of ventilation in maintaining life was demonstrated by Vesalius (1514 - 1564)[8] who was able to restore the activity of the heart in an apnoeic dog by insufflating air into trachea through a Reed. Hook (1635 - 1703)[9] subsequently showed that the essential factor is the supply of fresh air which he allowed to escape through puncture holes in the pleura after the lung had been exposed. Boyle (1627 - 1691)[10] and, to lesser extent, Mayow (1643 -1679)[11] demonstrated that the constituent of air which supports combustion also supports life. Lower (1631 -R71691)[12] further showed that the uptake of air in the lung causes the blood to change colour. These discoveries laid the foundation for subsequent studies of gas exchange but their importance was not immediately apparent.

The shape of the population pyramid is gradually changing from a wide base/ narrow top, to a barrel-shaped form. People older than 60 years, constitutes one of the fastest-growing population segment with increase in the number of the older-old (persons above 80 years)[13].

In applied Physiology first time in 1679[14] the stroke output of the lung was measured and was used as a test of lung function in 1846. Borelli (1679)[14] measured the volume of air which a man can inhale during a single deep breath, subsequent work established that this value in an average adult is about 3.3 - 4.9 litre). Davy (1800)[15] was the first who measured the residual volume by a gas dilution method. Thackrah (1831)[16] showed the volume of air which a person can inhale during a single deep breath is less in women than in men. Hutchinson (1846) defined the vital capacity as the "greatest voluntary expiration following the deepest inspiration" and designed a spirometer for its estimation. He showed that vital capacity is related to the height that for every inch of height (from 5 ft. to 6 ft) eight additional cms inches of air at 60°F are given out by forced expiration. He further showed that the vital capacity decreases with age, excess weight and lung disease.

Danders (1849)[17] demonstrated the role of elastic recoil of the lungs causing expiration, was the first to measure the retractive force. The work was extended by Cloetta (1913)[18]. Peabody (1915)[19] gave an idea of the relationship of vital capacity to breathlessness. The term Forced Vital Capacity was used first time by Strohl (1919)[20]. Roher (1915)[21] tried to explain the relationship between the force exerted by the respiratory muscles and the rate of air flow on the basis of Newton's law. This work was further extended by Neergaard and Wirz (1927) using the pneumatochrograph of Fleisch. Neergaard in the same year (1927) also demonstrated the role of surface forces in the lung by comparing the relationship of lung volume to retractive force when the air in the lung was replaced by water.

Jansen, Knipping and Stromberger (1932)[22] calculated the equivalent minute volume froo kyaograph records of a forced vital capacity and introduced the term maximal breathing capacity as one of the lung function test. The measurement of maximal breathing capacity was made first time in 1933 by Hermannsen. Christie (1934) demonstrated the role of change in lung distensibility in causing breathlessness.

MATERIAL AND METHOD

The present study "The Cardiorespiratory Function Tests" was conducted on a randomly selected 110 apparently healthy subjects of 60 years and above age group belonging to both the sexes at Agra. The survey v/as conducted under the joint auspices of Department of Physiology and Department of Cardiology, S.N. Medical College, Agra.

The following Cardiorespiratory function tests were carried out on these subjects

1. Vital Capacity in ml.

The survey was conducted at Sheesh Mahal Teela, Taj Garden, Motilal Nehru Garden and Company Garden in Agra. Before assessment of various cardiorespiratory function tests a careful record of age, sex.

Those subjects on whom any suspicion of cardiorespiratory pathology was suspected, or were on any antihypertensive medicine, of any chronic respiratory disease, were not included in the survey study.

A demonstration of technique of the use of instruments was displayed to the subjects and before they were given the instrument to be handled, all of them were properly apprised of in s and outs of these instruments and of their use. Furthermore, they were explained quite at length about desired precautions to be observed under the process of recording of these parameters in order to avoid any mistake.

Methods for Recording:

(1) Vital Capacity : It is defined as maximum volume of air that a person can forcefully expire with maximum expiratory efforts after taking deepest possible inspiration. It is expressed in terms of litres.

Procedure :

The instrument used was Spirometer. Before starting the test, procedure was well demonstrated to the subject. The pointer was adjusted to zero level. The subject was asked to take the mouth piece in the grip of his mouth. Now the subject was instructed to take a deepest possible inspiration in order to fill the lungs with air to the maximum extent. The nose was closed with nose clip and then exhaled out the air with maximum expiratory efforts through mouth piece. Three readings were taken at the interval of five minutes. Highest of three was taken as final reading for the study.

Precautions:-

The following precautions were taken to obtain the best results:-

(i) The subject was explained the detailed procedure.

(ii) The subject was taken in full confidence before starting the test,

(iii) The spiroaseter was thoroughly checked for any zero error,

(iv) Measures were taken to avoid any leaks through nose or from around the mouth piece.

(v) Resistance and inertia of the instrument should be minimum. The air passage should be wide (more than 3.2 cm).

Before taking reading the subjects were given preliminary training/practice attempts to attain the best of their ability.

OBSERVATIONS

In the present study "Assessment of Cardio-respiratory function tests in Indian Population of 60 years and above Age Group", 110 subjects belonging to different both sexes were studied. Out of these 110 subjects, 84 were male and 26 female. The details of these findings in different sexes are shown in Tables no. 1.

Ageing is a progressive failure of body's homeostatic adaptive response resulting in increased vulnerability to environmental stress and disease. The physiological sign of ageing are gradual deterioration in function and capacity to respond to environmental stress. Ageing is a general physiological on-going process and despite intensive research the mechanisms of ageing are still to be explored. Even though the mechanism of ageing will probably be attributed to a number of different regulatory mechanisms; such as cellular or molecular function, the study of system-integration should remain an important topic in the scientific investigation of ageing (Shock, 1977)[23]. The performance of most human physiological functioning is dependent on the co-ordinated efforts of several organ systems.

Shock (1979)[23] demonstrated greater ageing decrements in the performance of integration system than in the separate variables themselves. One of the most rapidly declining and perhaps most devastating decrement in ageing is the declining functional ability of cardiorespiratory system.

The present study of evaluation of cardio-respiratory functional ability in elderly group was conducted with

the objective to determine the effect of two group on these functional abilities and also to compare and observed. we are studied in relation in both the sexes.

In elderly man (60+) mean the average vital capacity (V.C) was 2334.3 ± 370.3 ml and in elderly women (60+) 2206.2 ± 297.5 ml. The vital capacity shows a declining pattern with age in all age groups in men as well as in women and the relationship is statistically significant in both the sexes ($p < 0.01$ in men as well as in women).

Table - 1: Comparative evaluation of vital capacity of total number of male and female subjects studied (n= 110)

Sex	No. of Cases	Vital Capacity in ml	
		Mean	S.D.
Male	84	2334.30	± 370. 30
Female	26	2206.20	± 297.50

t = 7.1103 P < 0.01

CONCLUSION

The prediction equations have been developed for spirometry variables in elderly group of Indian origin using the current ATS/ERS spirometry standardisation recommendations. The equations suggest an improvement in the lung health of the population over time in the middle-aged and the elderly. These equations should address a long-felt unmet need and enable a more appropriate evaluation of spirometry data in different chest diseases in Indian subjects. It can be applied clinically for improving balance in elderly population.

Ethical Clearance - Approved

Source of Funding - Self

Conflict of Interest - Nil

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Effect of Aerobic Exercise Training on Body Composition Using Skin Fold Thickness

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ABSTRACT

Aim- Aim- aim of our study was to see the effect of aerobic exercise training on body composition. **Objectives-** effect of aerobic exercise on skinfold thickness and % of body fat. **Material and method**- students between the ages 18 to 25 years under went treadmill aerobic exercise training for a period of 60 days (three days per week). Their biceps, triceps, calf skin folds, waist circumference, hip circumference all were recorded every 15 days and one month after detraining. **Statistical analysis**- repeated measures ANOVA of different parameters at different time interval during the exercise-training period with Bonferroni correction was used. **Results**-. There was a significant difference ($p<0.0001$) in the parameters like, Biceps, triceps and Calfskin fold over a period of exercise training of two months. % of body fat and BMI were decreased but not statistically significant. **Conclusion**- From our study we conclude that aerobic exercise training has a positive effect on body composition by reducing the skinfold thickness and also % of fat and BMI, possibly reducing the risk factors for cardiovascular diseases.

Keywords*: aerobic exercise, body composition, skinfold thickness, body fat.*

INTRODUCTION

Excess body fat produces severe adverse consequences on health, such as high blood pressure and changes in lipid profile constituents, including total cholesterol[1], in adolescents. One possible way of avoiding these health risks is prevention of overweight and obesity. This can be avoided by changing the life style like sedentary life, food habits[2]. Previous studies have shown that aerobic exercise-based interventions promote positive changes in the body composition of adolescents, such as reductions in body mass index (BMI) and body fat percentage (BF%)[3]. There are numerous techniques that are used to assess body composition. Estimates of body composition based upon simple straight-forward anthropometric measurements have been available for many years. The majority of these methods rely on the ability of measurements of subcutaneous fat folds or skin-folds at selected sites to predict accurately total body fatness[4]. Skin fold thickness is very easy and simple method of estimating the body composition specially in children, and also there are many equations available for estimating the body fat[5]. Study done by sarria et al[6], showed that Skinfold thickness measurements are better predictors of body fat percentage than body mass index. Regular aerobic exercise training can reduce the body fat and skinfold measurement and also improves the cardiovascular fitness[7]. Different studies used different aerobic exercise to see the effect of exercise on body fat composition and skinfold thickness like electromagnetically braked ERGO-FIT® brand cycle ergometer[8], treadmill[9] and Aerobic exercise program consists of two protocols with different intensity of the stretching and movement[10]. Aim of our study was effect of aerobic exercise training on body composition measured by using skin fold thickness and calculation of % of body fat.

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OBJECTIVES

1. Effect of aerobic exercise training on body composition measured by using skin fold thickness,

2. Calculation of % of body fat.

METHODOLOGY

Male subjects in the age group of 18-25 years were recruited from the student and staff population of St Johns medical college and hospital Bangalore. A brief history, general and systemic examination was performed and healthy subjects were recruited based on the inclusion and exclusion criteria. To the Subjects detailed description of protocol was explained. Subjects were asked to come early morning in the post absorptive state written informed consent was obtained from the subjects.

Inclusion criteria: Males in the age group of 18-25 years, Normal BMI(18.5-24.9 kg/m2), fasting over night before the day of recording ,not regularly involved in extreme physical activity.

Exclusion criteria: Diabetes mellitus, Hypertension, Cardiovascular diseases, Any other chronic diseases, Smokers, Athletes

PROCEDURE

Students were asked to come to the department of Physiology early morning between 7-8 AM, after an overnight fast. The subjects were explained in detail about the procedure. Recording was done in a quite room. Subject's height, weight, triceps, biceps and calf skin folds were measured. Then the subjects underwent moderate intensity aerobic exercise training for half an hour thrice weekly [8,10], alternate day over a period of 8 weeks. Bruce 3rd grade of Treadmill exercise (Treadmill speed of 4.8 kph and inclination of 10 degree) was adopted. This 3rdGrade of exercise corresponded to 55% to 69% of Target heart rate (THR), which represents the moderate degree exercise; the detail explanation of this is mentioned in the Treadmill exercise protocol below. All the Anthropometric parameters were taken once every 15 days. After 1 month of detraining again one more measurement was taken.

Treadmill exercise training procedure:

A constant speed 4.8 kph and an inclination of 10 degrees were maintained for all the subjects.

Continuous monitoring of Heart rate was done during the treadmill exercise with the help of an instrument called Wellshallyn. Subjects were made to do moderate degree exercise, which they achieved by walking on the treadmill with 4.8 Kph as speed and 10 degrees of inclination. The moderate degree exercise was based on their heart rate what they achieved during the exercise which was between 107 beats/min to 139 beats/min. This range of heart rate we calculated because the moderate degree exercise is considered when heart rate is between 55% to 69% of maximum heart rate [11].

The age of the subject being between 18 to 25 years. Maximum heart rate (MHR) was calculated by MHR=220 - Age of the person

For example 220-18=202 is the MHR For example 220-25=195 is the MHR

During the half an hour period of moderate exercise the HR was monitored and was between 107 to 139 beats/min.

Body weight and height measurements

Weight was measured using digital scale (OEHNLE-WAAGEN GmbH & CO, Murrhardt, Germany) and height was measured to the nearest 0.1 cm using stadiometer (Holtain limited, CRYMYCH, DYFED, Made in Britain).

Skin fold measurement

Triceps Skin fold

Triceps skin fold is measured in the midline of the posterior aspect of arm, over the triceps muscle at a point midway between the lateral projection of the acromion process of the scapula and the inferior margin of the olecranon process of the ulna. The measurement ids determined by measuring the distance between the lateral projection of the acromion process of the scapula and the inferior margin of the olecranon process of the ulna using a tape measure with the elbow flexed to 90 degree. The mid point of these two is marked on the lateral side of the arm. The skin fold is measured with the arm hanging loosely and comfortably at the subjects side .The skin fold is picked up by the left thumb and index finger.

Biceps Skin fold

Biceps skin fold thickness is measured as the thickness of a vertical fold of raised on the anterior aspect of the arm, aver the belly of the biceps muscle. The skin fold is raised 1 cm superior to the line marked for the measurement of triceps skin fold thickness and arm circumference, on a vertical line joining the anterior

border of the acromion and the centre of the anti cubital fossa. The subject stands, facing the measurer with the upper extremity relaxed at the side.

Calf skin fold

For the measurement of the medial calf skin fold the subject sits with the knee on the side to be measured flexed to about 90 degree, with the sole of the corresponding foot on the floor. The level of the maximum calf circumference is marked on the medial aspect of the calf. The measurer raises the skin fold parallel to the long axis of the calf on its medial aspect, when viewed from the front, at a level slightly proximal to the marked site. The thickness of the fold is measured at the marked level to the nearest 0.1 cm. calf, hip and waist circumference were also measured using standard technique [12].

Percentage body fat (% BF) was calculated by using formula-

% BF = 42.42 + 0.003 × age (years) + 7.04 × gender (M = 1, F = 2) + 0.42 × triceps skinfold (mm) + 0.29 × waist circumference (cm) +0.22 × weight (kg) − 0.42 × height (cm) [13].

RESULTS

Table 1: Subject characteristics of the 18 normal healthy young adults between the age 18 to 25 years

Variables	Mean	SD
Age	20.44	± 2.24
Height (meters)	1.70	± 0.06
Weight (kgs)	61.49	± 7.99
BMI	21.65	± 2.22
SBP(mm Hg)	115.77	± 4.46
DBP (mm Hg)	74.77	± 5.16
HR (beats/min)	78.44	± 4.79
Waist circumference (cm)	72.78	± 6.80
Hip circumference (cm)	88.12	± 21.42
Calf circumference (cm)	33.36	± 2.28
Triceps skin fold (mm)	13.26	± 3.80
Biceps skin fold (mm)	7.47	± 2.72
Calf skin fold (mm)	11.67	± 3.84

Table 2: Repeated measures ANOVA of different parameters at different time Interval during the exercise training period including detraining period.

Variables	Baseline	15 days	30 days	45 days	60 days	1month	P
						Detraining	Value
Biceps	7.47(2.72)	6.76(2.33)	6.29(2.20)	5.95(2.11)	5.70(2.04)	6.62(2.42)	0. 0001
Triceps	13.26(3.92)	12.59(3.85)	11.69(3.65)	10.84(3.52)	10.29(3.57)	12.00(3.76)	0. 0001
Calf	11.67(3.84)	11.35(3.85)	10.95(3.90)	1046(3.94)	10.17(3.86)	11.19(3.92)	0. 0001

- **Values are Mean (S.D)**

Repeated measures ANOVA was done for different parameter measured during the exercise training period, There was a significant difference ($p<0.0001$) in the parameters like, Biceps, triceps and Calf skin fold over a period of exercise training of two months.

Table 3: Repeated measures ANOVA of different parameters at different time interval during the exercise training period excluding detraining period with Bonferroni correction

Variables	Baseline	15 days	30 days	45 days	60 days	P value
Biceps[1]	7.47(2.72)	6.76(2.33)	6.29(2.20)	5.95(2.11)	5.70(2.04)	0. 0001
Triceps[1]	13.26(3.92)	12.59(3.85)	11.69(3.65)	10.84(3.52)	10.29(3.57)	0. 0001
Calf[1,2]	11.67(3.84)	11.35(3.85)	10.95(3.90)	1046(3.94)	10.17(3.86)	0. 0001

.-Values are Mean (S.D

1 significant difference across 5 group using an ANOVA of repeated measures ($p<0.05$)

2 significantly different between the group's using a post-hoc Bonferroni-corrected pair-wise t-test

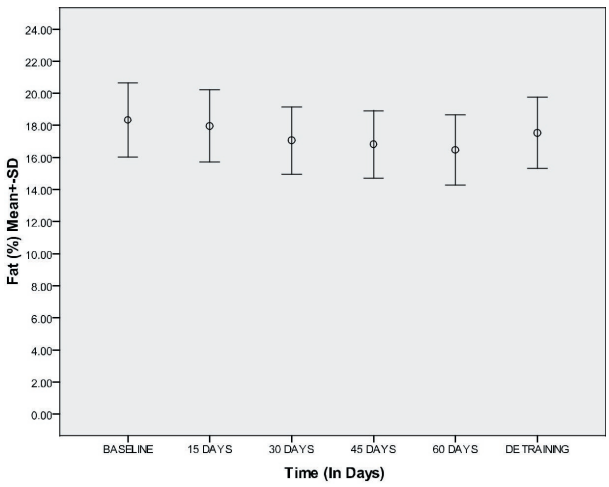

Figure 1: Repeated measures ANOVA of % fat

Repeated measures ANOVA of % fat was done to see the change in the % fat over a period of exercise training of two months, there is a change in the % fat over a period of two months exercise, but was not significant.

There is a decrease in the BMI over a period of 2 months of exercise but not significant.

DISCUSSION

According to our results as shown in table 2 and 3 we can see the significant ($P<0.001$) decrease in all the skin folds (triceps, biceps and calf folds) over a period of 60 days and also 1 month detraining effect where it showed significant increase in skin fold again. Our results were same as that of previous studies[14], there was significant decrease in all folds with all grades of exercise, except triceps where it was seen only with high amount vigorous intensity exercise. Study was done in undergraduates to see the effect of physical activity and inactivity on their BMI and different parameters of anthropometry. A higher fat mass Percentage was found in sedentary students compared with more Active ones [15], by using Electromagnetically braked ERGO-FIT® brand cycle ergometer, physical exercise program showed decreased triceps skinfold thickness[8], Aerobic exercise program consists of two protocols with different intensity of the stretching and movement [10].

This demonstrates that physical exercise can indeed promote positive changes in body composition even if no caloric restrictions are implemented [8].

According to the previous researches, aerobic exercise reduces fat mass and decreased body weight that followed. 4 weeks for $VO_{2\ max}$, 6 weeks and 8 weeks for body weight and BMI, body fat mass, and to change HDL levels in blood [16]. Regular exercise may be a gradual reduction of TG (triglycerol), TC(total cholesterol), LDL, BMI, body mass, body fat and increase HDL[17].

Aerobic exercise and physical activity significantly reduces body fat content for the treatment of heart disease, it is very important in cardiovascular exercise (aerobics) compared to other training. Since exercises are aerobic in nature are more effective in reducing body fat percentage[18]. Aerobic exercise increases skeletal muscle specific lipoprotein lipase activity, which actually has role in oxidation of fat and anti obesity effect, and also increase in capillary density, use of fatty acids may increase the blood levels of HDL[19].

In our study we did repeat measurement of skin folds after 1 month of detraining, where it was seen that the skin fold has started increasing significantly ($P<.0001$). % fat was calculated to see the change in the % fat over a period of exercise training of two months. There was a change in the % fat and BMI over a period of two months exercise, but was not statistically significant.

Thus, we feel exercise for a longer duration could perhaps be required for a significant reduction in body fat mass[20].

CONCLUSION

From our study we conclude that aerobic exercise training has a positive effect on body composition by reducing the skinfold thickness and also % of fat and BMI, possibly reducing the risk factors for cardiovascular diseases.

Conflict of Interest – Nil

Source of Funding- Self

Ethical Clearance – Got from institutional ethics committee.

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Sural Nerve Conduction Studies in Type 2 Diabetes Mellitus Patients with Clinically Undetectable Peripheral Neuropathy

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ABSTRACT

Background: Diabetic neuropathy (DN) is one of the most commonly occurring microvascular complications accounting for 28% of all the complications in diabetics [3].It is a progressive process that has a long asymptomatic stage

Aims &Objectives: The present study was planned to evaluate the Sural nerve conduction studies in type 2 diabetic subjects for early detection and quantification of peripheral neuropathy.

Material & Method: Study was done in Gandhi Medical College, Bhopal and The study was approved by the ethical committee of Gandhi Medical College. 40 Type 2 DM patients with clinically undetectable Peripheral Neuropathy and 40 age matched controls were selected for the study based on the inclusion and exclusion criteria and consent to participate in the study. For the nerve conduction study test , RMS EMG EP Mark II was used.

Results: Showed significant ($p<0.05$) increase of Distal latency and decrease of Conduction Velocity and Amplitude in sural nerve except conduction velocity of Right Sural nerve of the clinically undetectable peripheral neuropathy group as compared to control group.

Conclusion: Nerve conduction studies can diagnose Diabetic Neuropathy at a very early stage even before symptoms & signs set in. Thus nerve conduction velocity can be used as non-invasive method to assess early asymptomatic diabetic neuropathy in diabetic patients.

Keywords: *Type 2 Diabetes Mellitus, Diabetic neuropathy, Nerve conduction study, Sural nerve.*

INTRODUCTION

As the world shifts from a high prevalence of infectious diseases to chronic diseases, type 2 diabetes mellitus (T2DM) is becoming a major international health concern. India, in particular, is poised to become the world's leader in the prevalence of T2DM, and it already has a larger number of people with diabetes than any other country in the world.[1]

Diabetes mellitus (DM) is a group of metabolic disorders characterized by a chronic hyperglycemic condition resulting from defects in insulin secretion, insulin action or both. Permanent neonatal diabetes is caused by glucokinase deficiency, and is an inborn error of the glucose-insulin signaling pathway. The two broad categories of DM are designated type 1 and type 2. Type 1 diabetes is the result of complete or near-total insulin deficiency. Type 2 DM is a heterogeneous group of disorders characterised by variable degrees of insulin resistance, impaired insulin secretion, and increased glucose production. [2]

Diabetic neuropathy (DN) is one of the most commonly occurring microvascular complications accounting for 28% of all the complications in diabetics[3]. It is a progressive process that has a long asymptomatic stage [4].

It is important to identify neuropathy in the asymptomatic stages as the disease process progresses to the diabetic foot, a highly morbid condition that arises from the infection and the ulceration of the foot, finally leading to amputation [5]. It is estimated that 35% to 45%

of Type 2 diabetic patients have diabetic polyneuropathy (DPN). Advanced DPN causes serious complications, such as diabetic foot ulcers, gangrene, and Charcot joint, all of which worsen the quality of life in diabetic patients.[6]

Therefore, early detection of nerve dysfunctions is important to provide appropriate care for patients with DPN.

The diagnosis of diabetic peripheral neuropathy is mainly based on the characteristic symptoms.[7] But symptoms usually develop at any degree of neuropathic impairment or may not develop at all. This indicates the need for doing nerve conduction studies (NCS).[8]

It is reported that poor glycaemic control is responsible for microvascular complications.[9] Glycated haemoglobin (HbA1c) has not only been established as a marker of glycaemic control but it also indicates the risk of developing small vessel complications.[10]

Electro diagnostic tests can be used to detect diabetic neuropathy at an early stage (before development of the signs or symptoms of neuropathy).[11] Electrophysiological studies are more sensitive than clinical examinations as clinical examinations fail to offer quantitative results. It has been established that electrodiagnostic assessments are sensitive, specific and reproducible measures of the presence and severity of peripheral neuropathy and they also correlate with the morphological findings of nerve biopsy and thus define quantitative nerve dysfunction.[12]

Many authors have reported distal symmetric polyneuropathy in patients with type 2 diabetes mellitus (Chandrashekhar A ,Amanda J, Kakrani AL ,Kong X).[13,14]

In Type 2 diabetic patients decreased Nerve Conduction Velocity (NCV) is probably one of the earliest neuropathic abnormalities and is often present even at diagnosis. [15]

Demyelination and axonal loss of sural nerve was reported by Kong X et al (2008). [14]

It is well known that neuropathy has a metabolic component in its pathophysiology.[16] Hence early metabolic aberrations as seen in impaired glucose tolerance (IGT) may also lead to changes in the nerve conduction. Studies in the Caucasian population have shown that IGT is associated with dysfunction in peripheral nerves. [17]

Most of the nerve dysfunctions begin in the sensory nerves of the lower extremities. Thus this study was planned to measure the sensory function in the lower limb nerves by electrical stimulation in type 2 diabetics and for this Sural nerve was selected because it provides the highest diagnostic sensitivity.

With this background the present study was planned to evaluate the Sural nerve conduction studies in type 2 diabetic subjects for early detection and quantification of peripheral neuropathy.

METHODOLOGY

The present study was conducted in the Department of Physiology, Gandhi Medical College, Bhopal in collaboration with the Department of Medicine, Gandhi Medical College, Bhopal. The study was approved by the ethical committee of Gandhi Medical College. The biochemical investigations were done in post graduate Biochemistry laboratory of Department of Physiology.

- Study design- Case control study

MATERIAL

40 Type 2 DM patients with clinically undetectable Peripheral Neuropathy were selected for the study based on the inclusion and exclusion criteria and consent to participate in the study.

The subjects were introduced Michigan (MNSI) [324] questionnaire and Michigan examination for the screening of the peripheral neuropathy.

STUDY GROUP

- **Inclusion criteria**

1. Age 30-60 years.
2. Diagnosed cases of Type 2 diabetes mellitus with fasting plasma glucose (FPG) ≥ 126 mg/dl or 2 hrs postprandial glucose value (PPPG) ≥ 200 mg/dl. (ADA criteria 2015)
3. No known endocrinal and metabolic disorders other than diabetes.
4. Subjects not undergoing any kind of medical treatment with neurotoxic drugs.
5. Resting blood pressure not in hypertensive range (SBP ≥140mmHg, DBP≥90mmHg).

- **Exclusion criteria**

1. Age less than 30 years and more than 60 years.
2. Patient undergoing any drug therapy that may result in neuropathies as adverse effect.
3. History of peripheral neuropathies or nerve compression due to trauma or any other medical ailment.
4. Patients with other causes of neuropathy such as alcoholism, liver or renal disease, toxic exposure, other endocrine, metabolic or nutritional disorders, inflammatory diseases.
5. Patients not willing to participate.

CONTROL GROUP

Age & sex matched, 40 healthy non diabetic volunteers in the age range 30-60 served as controls.

- **Inclusion criteria**

1. Healthy, asymptomatic non diabetic subjects, aged 30-60 years.
2. Fasting plasma glucose <100mg/dl or 2 hrs postprandial glucose value (PPPG) < 140 mg/dl.
3. No diagnosed neuropathies.
4. Resting blood pressure not in hypertensive range (SBP ≥140mmHg, DBP≥90mmHg).
5. No known endocrinal, metabolic, renal or cardiovascular disorder.

Exclusion Criteria

1. Age less than 30 years and more than 60 years.
2. Subjects taking neurotoxic drugs.
3. Resting blood pressure in hypertensive range (SBP ≥140mmHg, DBP≥90mmHg).
4. Subjects not willing to participate.

2- EQUIPMENTS & INSTRUMENTS USED

a- RMS EMG EP MAK II

General instructions to the patients:

All the subjects will be briefed and the procedures will be demonstrated before carrying out the actual procedures.

Subjects will be instructed to-

i. Wear loose fitting clothes.

ii. Avoid chemicals, body oils and lotions over limbs.

Sural nerve conduction study

1. Position: This study was performed in the supine position.
2. Active electrode (A): Placement was such that the active electrode is over the dorsolateral surface of the foot at the midpoint of the 5th metatarsal and just lateral to extensor digitorum brevis tendon of the 5th toe. The reference electrode was distal.
3. Ground electrode (G): Placement was on the dorsum of foot.
4. Stimulation point (S): The cathode was placed 12 cm proximal to the active electrode behind the lateral malleolus.

Sural nerve recording

PARAMETERS RECORDED:

- History of present and past illness relevant to the research protocol
- Family history
- Personal history
- Drug history
- Complete clinical examination
- Anthropometric measurements
  - o Weight (Kg)
  - o Height (cm)
  - o Body mass index (Kg/m^2)
- Biochemical investigation: Fasting plasma glucose and Post Prandial Glucose (GOD-POD method) (Semi-Auto Analyzer Merck-300) and HbA1C
- Nerve conduction study was done using RMS EMG EP MAK II. Nerves studied were: Sural nerve sensory

Nerve conduction parameters recorded were:

- DL(Distal latency) for sensory nerves
- Nerve Conduction Velocity for sensory (SNCV) nerves.
- Sensory nerve action potential (SNAP) for

sensory nerves

STATISTICAL ANALYSIS PLAN

All the data were expressed as mean ± SD. The significance of difference between parameters recorded was calculated using unpaired Student's t-test for comparison between control & clinically undetectable Peripheral Neuropathy group. 5% level of significance will be considered. Statistical analysis was done using SPSS 16.0 (statistical package for social sciences)

RESULT

The mean age of control group and clinically undetectable peripheral neuropathy group were 43.82±8.37years and 39.6±9.1 years respectively (age range 30-60 years).

The body mass index was in normal range for the whole study population.

The mean values of cardiorespiratory parameters measured were in normal range in all the subjects at the time of investigations.

Analysis of electrophysiological variables recorded showed significant ($p<0.05$) increase of Distal latency and decrease of Conduction Velocity and Amplitude in sural nerve except conduction velocity of Right Sural nerve of the clinically undetectable peripheral neuropathy group as compared to control group.

Table 1 : Comparison of Sural Nerve Conduction Studies:- Latency (in milliseconds) Amp (in microvolts) & CV (in m/s), in Asymptomatic Diabetics and Healthy Controls.

Parameters	Variables	Diabetic (Mean±SD)	Controls (Mean±SD)	p-Value
R-Sural	Latency (ms)	3.25±1.02	2.42±1.04	<0.0006*
	Amplitude (μv)	5.84±5.71	11.34±9.82	<0.0030*
	Velocity (m/s)	45.08±15.57	48.33±16.86	NS
L-Sural	Latency (ms)	2.79±0.58	2.11±0.83	<0.0001*
	Amplitude (μv)	7.69±7.54	14.35±8.85	<0.0005*
	Velocity (m/s)	47.47±6.97	59.10±19.15	<0.0005*

**statistically significant, NS-not significant*

DISCUSSION

Diabetic neuropathy is the commonest of all neuropathies in developing countries. Since, diabetic population is increasing, the incidence of diabetic neuropathy is also expected to increase in the future.

Subclinical diabetic neuropathy or asymptomatic neuropathy has been defined as the presence of the nerve lesions associated with diabetes mellitus in the absence of abnormal clinical signs and symptoms .[373]

In study by Balaji Ret al (2015) patients without any symptoms of tingling or burning sensations had an incidence of 85.7% of neuropathy on NCS whereas patients with symptoms had an incidence of 91.7%, which signifies that patients even without any symptoms has a high incidence of neuropathy which showed the importance of NCS for the early diagnosis and treatment. [358] In our study neuropathy was detected electrophysiologically in all the patients without clinically detectable signs and symptoms like tingling or burning sensations .

Diabetes causes DPN by promoting neuronal apoptosis and inhibiting nerve regeneration, which leads to significant deficits in tactile sensitivity, vibration sense, lower-limb proprioception, and kinesthesia.[380]

Certain pro-inflammatory cytokines including IL-6 and TNF-α are also elevated during hyperglycemia and are thought to contribute to nerve cell damage.[381]

The result of present work is in conformity with Liu MS et al(2005) who studied clinical and neurophysiological features in 700 T2DM patients in China. They reported that subclinical Diabetic Peripheral neuropathy can be detected by elctrophysiological studies.[383]

In Pakistan, Niazi et al (2001) evaluated diabetic polyneuropathy by doing electrodiagnostic study on fourty-one patients in 2001. It was suggested that these studies are capable of diagnosing diabetic neuropathy even before clinical manifestations. [384]

Various studies states that in diabetic patient the sensory nerves are more affected than motor nerves and lower limbs are more affected than upper limbs.[354, 358] Kakrani et al(2014) performed nerve conduction study on 50 patients of diabetic neuropathy out of which all patients i.e. 100% had involvement of lower limb and 48% had involvement of upper limb. They also suggested that involvement of lower limb was more common due to length dependent dying back process. They also opinioned that nerve conduction studies detects neuropathy changes even before signs develop.[2]

Study by Xuan K(2008) showed that the sural nerve had abnormal Distal Latency in 58.3% and SNAP in 62.7%. Present study too had Axonal neuropathy in Sural nerve as compared to demyelinating neuropathy.[14]

According to Asad A et al, (2009) in all the components, amplitude (axonal neuropathy) is the strongest measure of neuropathic problems, also reported by the present study.[8]

CONCLUSION

The study concluded that NCS can diagnose Diabetic neuropathy at very early stage even before clinical signs symptoms set in. Early detection of Diabetic neuropathy is essential to decrease morbidity by early initiation of potential preventative measures, patient education, and effective therapeutic intervention.

The high reproducibility of nerve conduction studies and their close correlation with nerve fiber damage make these tests sensitive indicators of the peripheral neuropathy.

The observations of the present study confirmed the existence of predominantly Axonal sensory peripheral neuropathy in the nerves investigated in clinically undetectable Peripheral neuropathy patients.

It is also concluded from the study that peripheral neuropathy may be present in Type 2 DM patients without any clinically detectable signs and symptoms.

It is imperative to perform atleast one annual complete neurological examination and nerve conduction studies to facilitate early diagnosis of peripheral neuropathy.

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Effect of Music on Aerobic Exercise

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ABSTRACT

Background: Music has been suggested as an important component of mood enhancement and may help to make the aerobic workout more enjoyable and more beneficial for the individual.

Aim: The aim of the study is to investigate the effect of music on cycling with submaximal performance.

Materials and Method: Twenty participants of age group between 10-50 years were selected. Both sexes were included in this study. They performed cycling in Elliptical - vena -V950 model on two occasions. In the first session, the subject performs cycling without hearing music. The subjects were asked to do warm up for 3minutes with zero resistance, following this the resistance increased to 2 and the target heart rate maintained as 40% - 60% of maximal heart rate. In the second session, the subject listened music during cycling and follow the same procedure as he did in the previous session. At the end of each session the time duration of cycling and distance travelled were measured. RPE is measured once in every 5minutes. For measuring RPE Modified Brog's scale is used. Both the sessions were performed in morning before breakfast. The subjects with previous history of cardiovascular disease, hearing impairment, lower body deformities, metabolic & pulmonary diseases were excluded from the study. Alcoholic and smokers were also excluded. Informed written consent was obtained from the subjects.

Conclusion: This study shows that music improves distance and duration of cycling and music also causes reduction in RPE.

Keywords: *Music, Cycling, Rate of perceived exertion (RPE).*

INTRODUCTION

According to American college of sports medicine to remain healthy an individual should perform moderate intensity aerobic (endurance) physical activity for a minimum of 30 minutes for 5 days a week [(1)]. In the past few years there has been increase participation of people in aerobic activities to promote health and to reduce disease suffering. Recently fitness professionals realize that for complete benefit it is important not only to recruit these participants in recreational programme but also to retain them. Music has been suggested as an important component of mood enhancement and may help to make the repetitive aerobic exercise more enjoyable and more beneficial [(2,3)]. Music may aid in fostering recall of pleasurable memories and this may help to block the unpleasant feelings that could surface while workout[(4)].

During repetitive, endurance-type activities like cycling self-selected, motivational and simulative music has been shown to enhance affect, reduce ratings of perceived exertion, improve energy efficiency and lead to increased work output[(5,6,)]. There is evidence to suggest that carefully selected music can promote ergogenic and psychological benefits during high-intensity exercise, although it appears to be ineffective in reducing perceptions of exertion beyond the anaerobic threshold. The effects of music appear to be at their most potent when it is used to accompany self-paced exercise or in externally valid condition. The rhythm is beneficial to our muscles is that it has been proven that the muscles of our body will synchronize to the beat of the music. This means that the faster the musical rhythm the faster is our heart beat or the slower the rhythm the slower is

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our heart beat. Music acts as a natural motivational tool. The right music can be used as a tool to 'psych up' in preparation for performance (arousal regulation), shift attentional focus (association/dissociation), boost self-efficacy and encourage psychological skills usage (e.g. mental imagery).

The purpose of this study is to examine the effect of fast tempo music on RPE, distance and duration of cycling in a bicycle Ergometer.

MATERIALS AND METHOD

Twenty participants of age 10-50years were selected. They performed cycling in Elliptical - vena - V950 on two occasions. In the first session, the subject performs cycling without music in a bicycle ergometer at a constant speed of 2-4 rpm, initially subject is asked to do warm up for 3minutes with zero resistance following this the resistance increased to 2 and the target heart rate maintained as 40% -60% of maximal heart rate. In the second session, the subject listened music and followed the same procedure as he did in the previous session. The music used in this study is fast tempo music of >120beats/min. At the end of each session the duration, distance, is measured. RPE is measured once in every 5minutes.For measuring RPE Modified Brog's scale is used. Both the session, were performed in morning before breakfast. The subjects with previous history of cardiovascular disease, hearing impairment, lower body deformities, metabolic & pulmonary diseases were excluded from the study. Alcoholic and smokers were also excluded. Informed written consent was obtained from the subjects.

Informed written consent was obtained from the subjects.

Study Design: Prospective study.

Study Period: February 2016- August- 2016

Study was done in Thanjavur.

RESULT

Table 1 compares the distance and duration of cycling and also RPE before and after listening music. The mean distance covered by cycling before hearing music is 0.6260 and the mean distance covered after hearing music is0 .7135. The P value (0.003) tells us the music produces significant difference in distance covered by cycling. The mean duration of cycling calculated before hearing music is 9.40 and the mean duration of cycling calculated after hearing music is 10.70. P value (0.001) shows there is significance difference in duration of cycling before and after hearing music. The mean RPE calculated before hearing music is 4.45 and the mean RPE calculated after hearing music is 4.00. The. The P value for RPE at the end of 5 min is 0.001, indicating that the music causes significant reduction in rate of perceived exertion (RPE).

TABLE:1 Comparison of parameters of cycling before and after hearing music

S.no	Parameters	N	MEAN		Difference	P value
			Before	After		
1	Distance	20	.6260	.7135	-.08750	.003
2	Duration	20	9.40	10.70	-1.300	.001
3	RPE	20	4.45	4.00	.450	.001

Thus, from the above table it is clear that the music increases the distance and duration of cycling. The table also shows music reduces the Rate OF perceived exertion during cycling.

DISCUSSION

Recently available evidence shows that music captures attention, raises spirits, triggers a range of emotions, alters or regulates mood, evokes memories, increases work output, heightens arousal, induces states of higher functioning, reduces inhibitions and encourages rhythmic movement [7,8,9,10]– all purposes that have considerable application in the exercise domain. Although the mechanism that underpin the benefits of music is not clearly understood the scientist devoted insufficient attention is responsible for the effects of music on exercise [11,12,13]. The afferent nervous system transmits sensory impulses inwards to the central nervous

system. Since the capacity of the afferent nervous system is limited (an equivalent concept to internet 'bandwidth'), sensory stimuli such as music can impede the physiological feedback signals associated with physical exertion. In 1961 Hernandez Peon explained that pleasurable stimuli promote electrical activity in one sensory pathway while inhibiting electrical activity, and thus the transmission of information, in another sensory pathway[14,15]. In our study music decreases rate of perceived exertion which is similar to the study conducted by Yamashita et al [16] who tested the effects of favored music on RPE during cycle ergometer work at low *and* moderate intensities. But in another study "music on exercise domain" conducted by Costas I.Karageorgis the music reduced RPE at the low but not the moderate exercise intensity. However, Pottiger in his study have reported a strong effect at moderate exercise intensities [17,18]. This study is stressing the fact that fast music can increase the distance and duration of cycling which is accord to the study conducted by J Waterhouse,P Hudson,B Edward in2009 [19] . But in another study conducted by Reynolds and Guston 2010 the faster tempo music has been found by researchers to motivate exercisers to work harder when performing at a moderate pace, but peak performance has been found to be unaffected by listening to music.

CONCLUSSION

Thus, the present study concludes that fast music enhances the distance and duration of cycling along with the reduction in rate of perceived exertion. Hence listening to music while exercising has been found in multiple studies to increase the work rate either by causing distraction from fatigue or by motivation. Further studies are required to capture the actual cause for these beneficial effects of music.

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Surya Namaskar Versus Spot Jogging - Effects on Cardiovascular and HRV Parameters in Young Adults: A Pilot Study

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ABSTRACT

Background: Lifestyle diseases are increasing at a tremendous rate, especially in developing countries. Physical inactivity has been majorly blamed for the rise in these disorders, due to automation and advancement in the technology. Physical activity was a part of our routine lifestyle in the olden days. Physical activity like aerobic exercises & yoga have proved to be highly beneficial. Surya-namaskar, a form of yogic practice has been utilised to very small extent. Hence, we proposed to compare the effect of surya-namaskar with aerobic exercise in the form of spot jogging on the Cardio vascular & Heart rate variability in young healthy subjects.

Aim: To evaluate the individual effect of spot jogging and surya-namaskar of similar duration on cardiac parameters and Heart rate variability of healthy subjects and to compare the effects of spot jogging and surya-namaskar with each other.

Method: The subjects were randomly divided into Group I-surya-namaskar group (n=20) and Group II-spot jogging group (n=20). Group I performed surya-namaskar and Group II performed spot jogging (5 min/day for 6 weeks duration). Cardiovascular and Heart rate variability (HRV) parameters (SBP, DBP, heart rate(HR), VLF, LF, HF and LF/HF ratio) were recorded before and after six weeks of training in each group.

Result: The results showed that SBP, DBP, HR decreased significantly in both surya-namaskar and spot jogging group. LF values decreased significantly in spot jogging group, while a statistically significant increase in HF values was found in surya-namaskar group. LF/HF values decreased significantly in both the groups. On comparing surya-namaskar and spot jogging groups, it was found that difference between the mean values (pre and post) among the two groups was statistically significantly higher for HF component in surya-namaskar group.

Conclusion: Surya-namaskar & spot jogging are found to be equally beneficial in improving the cardiac & autonomic parameters; whereas Surya-namaskar showed better improvement towards parasympathetic dominance.

Keywords : *Surya-namaskar, spot jogging, HRV.*

INTRODUCTION

Modern industrial revolution with rapid advancement of technology has lead to increase in the stress and life style disorders. Physical inactivity is a major concern in the present day scenario. This physical inactivity has to lead to increase in the life style disorders. Whereas the physical activity conveys multiple well established health benefits including decreased incidence of coronary artery disease, hypertension, non insulin dependent diabetes mellitus, osteoporosis[1-3]. Regular physical activity will increase the body fitness and controls the weight greatly, reducing life style disorders. This results from maintaining moderately lower blood pressure (BP), reducing blood cholesterol and low-

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density lipoproteins along with increase in high-density lipoproteins and perhaps equally important is that physically fit persons have more bodily reserves to call on when he or she becomes stressed.

Aerobic exercise training increases cardiovascular functional capacity and decreases myocardial oxygen demand at any level of physical activity in apparently healthy person as well as in most subjects with cardiovascular diseases[4,5].

Physical activity in ancient India was part of routine life style & it was also complemented with yogic practices which supposedly had definite cardiovascular benefits; which has now been proved scientifically. Reviews have shown that psycho-physiological changes by yoga help in improvement of both musculoskeletal and cardio-pulmonary functions[6-8].

Surya-namaskar is one such yogic practices which has shown to be effective in making the body supple in terms of stretching many muscles and performing movements at many joints of the body. It involves physical and mental exercises which may or may not be compared to aerobic exercise [1,9].

The literal meaning of surya-namaskar is salutation to Sun. Surya-namaskar comprises of a series of 12 postures, teaching to co-ordinate rhythmic breathing with body postures into a flowing routine. The asanas in surya-namaskar is designed in such a way that each asana will be complimentary to the next. During surya-namaskar muscles of entire body experience stretch and pressure alternately and therefore it is said to give more benefits with less expenditure of time[9-11].

This work was undertaken because there is scarcity of research which evaluates the physiological benefits of surya-namaskar and spot jogging in the healthy subjects and weigh against the benefits at the same time. The aim of the study was to evaluate the individual effect of surya-namaskar and spot jogging of similar duration on cardiovascular & HRV parameters of healthy subjects and inturn compare these effects with each other.

METHOD

The study was conducted in department of Physiology, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun. After obtaining ethical clearance from the Institutional ethical committee, the study was conducted on 40 healthy medical students aged 18-30 years. Trained individuals in yoga & sports, smokers, obese and individuals with history of major surgery and illness were excluded from the study. Subjects were explained the study protocol & the right to terminate during the course of study & written informed consent was taken.

The subjects were randomly divided into two groups.

Group I:- 20 participants performed surya-namaskar for 5 min/day for 6 weeks duration under the guidance of investigator.

Group II:- 20 participants performed spot jogging for 5 min/day for 6 weeks duration under the guidance of investigator.

Prior to the study, baseline data were collected from all the participants after taking a detailed medical history on the same time of the day. The following parameters were recorded: age, height, weight, BMI, SBP, DBP, HR and HRV parameters.

The data collection was done using computerized polygraph, which is a window based machine using software physiopac (Medicaid). HR and HRV was measured using it. BP was recorded using automated digital sphygmomanometer.

After recording of baseline parameters, the volunteers were trained in surya-namaskar or spot jogging depending on their respective groups. Once trained, the volunteers were instructed to practice their respective exercises for six weeks at the same time daily. Following six weeks practice, the cardiovascular & HRV parameters were reassessed.

STATISTICAL ANALYSIS

All the values obtained before and after performing surya-namaskar and spot jogging were expressed as Mean±SD. Data was analyzed by statistical package for social science (SPSS version 17). Anthropometric parameters of both the groups were analyzed and compared, using independent t-test. Cardiovascular parameters of pre & post surya-namaskar and spot jogging groups were analyzed and compared, using ANOVA and post hoc test LSD. Difference of mean values pre & post surya-namaskar and pre & post of spot jogging group was calculated and analyzed using independent t-test. $P < 0.05$ was considered as

statistically significant.

RESULTS

Anthropometric parameters, cardiovascular & HRV recordings were compared between surya-namaskar and spot jogging group and there was no significant difference between the groups (p value >0.05) (Table 1, Table-2).

Table-1: Comparison of anthropometric parameters among surya-namaskar (Group I) and spot jogging (Group II)

Variables	Group I (n=20)	Group II (n=20)	p value
Age (years)	18.6±1.2	19.2±1.4	0.803
Height (cm)	166.2±10.5	165.8±10.0	0.920
Weight (kg)	57.9±7.6	59.8±10.2	0.190
BMI (kg/m^2)	21.3± 2.1	21.5±2.3	0.581

p value : <0.05(significant); >0.05(not significant)

Pre and post training cardiovascular & HRV parameters of surya-namaskar and spot jogging group as shown in table-2 indicate that mean SBP, DBP and HR of post surya-namaskar group was significantly lower; while HF was significantly higher than that of pre surya-namaskar group . There was also significant decrease in mean SBP, DBP, HR and LF value in post spot jogging group as compared to pre spot jogging.

Table-2: Comparison of Cardiovascular & HRV parameters among surya-namaskar and spot jogging group

Variables	Group I (n=20)		Group II (n=20)	
	Pre surya-namaskar	Post surya-namaskar €	Pre spot jogging £	Post spot jogging ¥
SBP (mm Hg)	114.6±7.5	108.6±5.9**	111.4±6.4^	106.3±4.5**
DBP (mm Hg)	76.8±5.4	73.2±3.8*	76.2±5.9^	73.2±3.9*
HR (beats/min)	82.6±3.1	79.3±4.5**	82.8±4.0^	80.5±2.8*
VLF (Hz)	0.028±0.009	0.025±0.008^	0.029±0.007^	0.026±0.008 ^
LF (Hz)	0.074±0.037	0.059±0.022^	0.081±0.038^	0.058±0.022*
HF (Hz)	0.19±0.029	0.222±0.034**	0.187±0.030^	0.185±0.033 ^
LF/HF	0.402±0.213	0.276±0.119*	0.445±0.25^	0.324±0.137*

p value : *<0.05(significant); **<0.01(highly significant); ***<0.001(very highly significant); ^>0.05(not significant) by ANOVA

€ : comparison between group I post and pre surya-namaskar

£ : comparison between group II pre aerobic exercise and group I pre surya-

namaskar

¥ : comparison between group II post and pre aerobic exercise

On comparing the difference of mean values (pre and post) of cardiovascular & HRV parameters among surya-namaskar and spot jogging group; statistically significant increase in HF was observed in Group I as compared to Group II, whereas the difference in mean values of SBP, DBP, HR, VLF, LF, LF/HF among the two groups was statistically insignificant(Table-3).

Table-3: Comparison of differences in the mean values of Cardiovascular & HRV parameters of (pre & post) surya-namaskar (Group I) and (pre & post) spot jogging (Group II)

Variables	Group I (n=20)	Group II (n=20)	p value
SBP(mm Hg)	6.0 ±4.4	5.1 ±6.6	0.615
DBP (mm Hg)	3.6± 3.1	3.0 ±4.1	0.600
HR(beats/min)	3.3± 3.1	2.3± 2.1	0.253
VLF(Hz)	0.003±0.006	0.003±0.009	0.984
LF(Hz)	0.015 ±0.02	0.075±0.05	0.491
HF(Hz)	0.032±0.026	0.002 ±0.04	0.01
LF/HF	0.126 ±0.133	0.121 ±0294	0.946

p value <0.05 is significant; >0.05 is not significant) by independent t test

DISCUSSION

Our study showed that cardiovascular and HRV parameters changed significantly in surya-namskar group as well as spot jogging group.

Surya-namaskar group showed statistically significant decrease in mean values of SBP and DBP. These finding are in accordance with Bhutkar et al and Herur et al, who also reported a statistically significant reduction in SBP and DBP after six months of yogic practice among normal subjects. Sasi et al reported a statistically significant increase in SBP and statistically significant decrease in DBP, following 45 days of daily practice of surya-namaskar by healthy school students[11-13].

In our study a statistically significant decline in mean values of HR was observed in surya-namaskar group. This observation is in accordance with the studies conducted by Bhutkar et al and Sasi et al on healthy subjects who practiced surya-namaskar for 6 months and 45 days respectively[11,13]. Fondran found statistically insignificant decrease in heart rate after training for 6 weeks of surya-namaskar[14].

On evaluating the HRV parameters following surya-namaskar practice, it was observed that the HF component increased and was statistically significant. LF/HF component decreased significantly while there was statistically insignificant decrease in LF values. Sarang et al in their study found a decrease in LF and LF/HF component and increase in HF component after cyclic meditation[15].

In our study both the SBP and DBP showed a statistically significant decrease following spot jogging. Seamus et al, reported a statistically significant reduction in both SBP and DBP on comparing aerobic exercise and control group[16]. White et al reported an increase in SBP and decrease in DBP after 12 weeks of exercise program in young and middle aged non-obese women, but these changes were statistically insignificant[17].

In current study a statistically significant decline in mean values of heart rate was observed after spot jogging. This is in accordance with the work of Sloan et al and Stein et al who found a statistically significant reduction in HR after aerobic conditioning of 12 weeks and 12 months respectively[18,19]. Tulppo et al found statistically significant decrease in HR in sedentary subjects after eight weeks training in both moderate and high-volume aerobic exercise groups[20].

The spot jogging group showed a statistically significant decrease in mean values of LF and LF/HF components, while a statistically insignificant decrease was observed in HF values. Tulppo et al reported that in both moderate and high volume aerobic trained groups; a statistically significant increase in normalized HF spectral component while a decrease in normalized LF component and a marked decline of LF/HF ratio[20]. Sandercook et al in a meta-analysis reported an increase in HF power after exercise training[21].

In the current study a significant reduction in SBP, DBP and HR was found in both surya-namaskar and spot jogging group. On comparing the two groups for the difference between mean values (pre and post); there was a greater decline in the values but was statistically insignificant. Telles et al reported a statistically significant decrease in HR after six weeks of yoga and games[22]. Bowman et al conducted a study on sedentary, healthy normotensive elderly subject and reported a statistically significant decrease in HR following six weeks of yoga but an insignificant decrease in HR after six weeks of aerobic training[23].

In our study a statistically significant decline was seen in LF/HF component in both surya-namaskar and spot jogging group, while LF component showed a statistically significant reduction in spot jogging group and HF component showed a statistically significant increase in surya-namaskar group. On comparing both the groups for the difference between mean values (pre and post) for the above mentioned parameters, the increase in HF component was found to be more, which was statistically significant in surya-namaskar group. This is in accordance with Bowman et al, who reported a statistically significant increase in HF value after six weeks of yoga but statistically insignificant change after six weeks of aerobic training[23]. Sathyaprabha et al, showed significant improvement in parasympathetic parameters in epileptic patients after 10 weeks of yoga as compared with healthy volunteer while the exercise group did not show any significant improvement[24].

In conclusion, a few weeks of disciplined practice of either surya-namaskar or aerobic exercise can lead to improvement in cardiovascular & autonomic functions , however a greater tilt towards parasympathetic dominance was observed following surya-namaskar.

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Study of Cardiac Autonomic Neuropathy (CAN) in Type II Diabetes Mellitus Patients Attending a Tertiary Health Care Center in Maharashtra

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ABSTRACT

Cardiac autonomic neuropathy (CAN**)** is one of the major complications of diabetes mellitus. Resting heart rate, deep breathing difference and valsalva ratio expresses cardiac autonomic function. Present study was done to estimate prevalence of cardiac autonomic neuropathy in type II diabetes patients and to investigate its association with glycemic control. The study group comprised of 60 type 2 diabetes patients within the age group of 40-60 years coming to a Tertiary health care center in Maharashtra and those hospitalized in medicine wards, They were further classified in to two sub-groups(n = 30 in each group), well controlled Type II diabetes patients (HbA1c < 7) and uncontrolled Type II Diabetes patients (HbA1c > 7). Glycosylated hemoglobin level was detected by calorimetric method (spectronic -2).The control group consisted of 30 age matched healthy subjects (volunteers). After thorough examination of the subjects as per the proforma resting heart rate, deep breathing difference and valsalva ratio were estimated using Physiopac I.n present study total 36 (60%) type II diabetes patients had cardiac autonomic neuropathy. Out of 60 type II diabetes patients 16 (26.66%) individuals were found to have severe cardiac autonomic neuropathy. While 20 (33.33%) had borderline Cardiac autonomic neuropathy (CAN) poor glycemic control is associated with abnormal valsalva ratio. The value of valsalva ratio was significantly lower in type II diabetes patients with poor glycemic control as compared to well controlled diabetics and healthy subjects. There was no statistically significant difference among value of deep breathing difference and resting heart rate in type II diabetes patients with poor glycemic control and type II diabetes with good glycemic control. Poor glycemic control is associated with impairment of cardiac autonomic function.

Keywords: *Uncontrolled diabetes, resting heart rate, Deep Breathing Difference, Valsalva Ratio, cardiac autonomic neuropathy.*

INTRODUCTION

Diabetes mellitus is characterized by chronic hyperglycemia associated with altered carbohydrate fat and protein metabolism due to defective insulin secretion, insulin action or both [1]. The worldwide prevalence of DM has risen dramatically in past two decades, from an estimated 30 million cases in 1985 to 422 million cases in 2014 [2]. Prevalence of type II diabetes is increasing very rapidly because of sedentary lifestyle and obesity. 6 of the top 10 countries with the highest prevalence of diabetes are in Asia [3].

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Studies in India indicate that more than 50% of people with diabetes have poor Glycaemic control (HbA1c > 7%), uncontrolled hypertension and dyslipidaemia, and a large percentage have diabetic vascular complication [4].

Vascular complication includes macrovascular and microvascular complications, Microvascular complications comprise Neuropathy, Retinopathy and nephropathy. Neuropathy includes both peripheral and autonomic neuropathy. Diabetic autonomic neuropathy may manifest as disturbances in cardiovascular, gastrointestinal or genitourinary system[5] and these complications are missed because they are usually asymptomatic for negligent patients. Cardiac autonomic

neuropathy (CAN) is one of the major complications of diabetes mellitus. It is also the most under diagnosed and least understood diabetic complications [6]. Poor glycemic control plays an important role in the development and progression of diabetic cardiac autonomic neuropathy, and studies have shown that reduced cardiovascular Autonomic Function is associated with increased morbidity and mortality. Research in this regard has suggested a strong association between hyperglycemia and the progression of microvascular complications in diabetic patients.

Glycosylated hemoglobin reflects long-term glycemic control and has proven to be a more accurate and stable measure than fasting blood glucose levels. Quantitative cardiovascular Autonomic Function tests which include estimating resting heart rate, deep breathing test, valsalva maneuver, calculating valsalva ratio are widely used to detect, verify and quantify the cardiovascular autonomic dysfunction. They have been tested for their validity and reliability. These tests are performed because the procedures are easy to perform bedside, these are reproducible and non invasive.

Earlier studies have suggested that patients with poor glycemic control have higher prevalence of cardiovascular autonomic neuropathy than in patients with good glycemic control in type I diabetes. Similar studies in type II Diabetes mellitus are relatively few in this region.

Present study is designed to evaluate and compare cardiac Autonomic Function tests in Type II Diabetics with poor control and compare it with Type II diabetics with good glycemic control and with age matched control group. Glycosylated hemoglobin levels are used as a measure of glycemic control.

METHOD

The study comprised of 90 subjects, 60 type II diabetes patients and 30 age matched normal individuals. Type II diabetes patients were selected randomly from diabetic O.P.D. and those referred from medicine wards. Age and sex matched controls were volunteers. Type II diabetes patients were further classified in to two sub-groups – Type II diabetes patients with good glycemic control (HbA1c < 7, n=30) and Type II diabetes patients with poor glycemic control (HbA1c > 7, n=30).

The study was approved by the ethical committee. The present study was carried out in accordance with the Helsinki Declaration all subjects participated voluntarily after being given a detailed explanation of the purpose of the study. Written and Informed consent were obtained from each subject. All subjects of the study underwent a full clinical examination and history.

Groups were selected by considering following inclusion and exclusion criteria.

Inclusion and exclusion criteria for different groups

Type 2 Diabetes patients with poor glycemic control (n=30).

All the subject having type II diabetes with Hba1c > 7 between the age group of 40-60 years were included in this group

Type2 Diabetes patients with good glycemic control (n=30).

All the subject having type II diabetes with Hba1c < 7 between the age group of 40-60 years were included in this group

Healthy Controls (n=30).

All non-Diabetic subject with Hba1c < 6 between the age group of 40-60 years were included in this group

All smokers, alcohol consuming patients, patients suffering from cardiovascular disease and patients who were on drugs altering autonomic function test were excluded from study

The laboratory tests were done between 7-9 a.m. in the lab with stable room temperature

(22-24^{o}C).

The subjects were instructed not to smoke, eat or drink coffee prior to examination. In the case of the diabetics, antidiabetic medication was given at the end of the examination.

Criteria for the diagnosis of diabetes:-

HbA1c ≥ 6.5%. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the Diabetes Control And Complication Trial (DCCT) assay.* Or
Fasting Plasma Glucose(FPG) ≥ 126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least8 h.* Or
2-h plasma glucose ≥ 200 mg/dl (11.1 mmol/l) during an oral glucose tolerance test (OGTT). The test should be performed as described by the World Health Organization, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.* Or
In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥ 200 mg/dl (11.1 mmol/l)

*In the absence of unequivocal hyperglycemia, result should be confirmed by repeat testing[7].

Glycosylated hemoglobin was estimated by modified method of Fluckiger and Winterhalter

Following three tests were used to evaluate autonomic function test of all subjects

1. Resting heart rate

2. Heat rate response to deep breathing (deep breathing difference)

3. Heart rate response to Valsava maneuver (valsalva ratio)

Presence of any two abnormal values of above mentioned 3 tests is considered as diagnostic criteria for presence of cardiac autonomic neuropathy.

Autonomic Function Test: The subjects were asked to relax in supine position for 30 minutes. Resting heart rate and respiratory activity were recorded by Physiopac-8: Computerized 8- channel biopotential acquisition system (Medicaid, Chandigarh) BP was measured with Omron Intellisense M3 Blood Pressure Monitor. The cardiovascular tests performed are detailed below in the order of execution. These tests were demonstrated to the subjects.

Deep breathing test: In the sitting position subjects were asked to breathe quietly and deeply at the rate of 6 breaths per minute. A continuous ECG was recorded for six cycles. The maximum and minimum R-R intervals were measured during each breathing cycles and converted to beats per minute. The result was then expressed as mean of the difference between maximum and minimum heart rate for six measured cycles in beats per minute.

Deep breathing difference (DBD) = mean of heart rate differences in 6 breath cycles.

Heart Rate response test	Normal	Borderline	Abnormal
Heart rate response to deep breathing.(DBD)	15 beats/min OrMore	11-14 beats/min	10beats/minim less.

Heart-Rate response to Valsalva Maneuver (valsalva ratio): The subjects were seated comfortably and asked to blow into a mouthpiece connected to a mercury sphygmomanometer and holding it at a pressure of 40 mm of mercury for 15 seconds. The ECG was continued to be recorded after release of pressure at the end of 15 seconds for 30 seconds.valsalva ratio was obtained by dividing maximum RR interval with minimum RR interval.

Valsalva Ratio(VR)= maximal tachycardia/maximum bradycardia

= maximum R-R interval/minimum R-R interval

Heart Rate response test	Normal	Borderline	Abnormal
response to Valsalva Maneuver.(VR)	1.21 or more	1.11-1.20	1.10 or less.

RESULT

The data collected has been statistically analyzed using SPSS version 19.

First basic characteristic age was compared in all three groups with ANOVA test tables and graphs are given below.

Table- 1: BASELINE STATISTICS FOR 3 GROUPS:

		Mean	Std. Deviation	Df	f	P value
RHR	Uncontrolled diabetes	90.17	9.454	2	39.93	< 0.001
	Controlled diabetes	87.03	12.40			
	healthy controls	68.67	7.792			
HbA1c	Uncontrolled diabetes	9.53	1.899	2	90.011	< 0.001
	Controlled diabetes	6.22	.710			
	healthy controls	5.71	.428			
DBD	Uncontrolled diabetes	11.10	4.054	2	13.006	< 0.001
	Controlled diabetes	11.40	5.769			
	healthy controls	17.53	6.442			
VR	Uncontrolled diabetes	1.07	.198	2	10.352	< 0.001
	Controlled diabetes	1.22	.148			
	healthy controls	1.25	.128			

COMPARISON OF TWO GROUPS

Table- 2: Uncontrolled diabetes patient group with Controlled diabetes patient group basic statistics

	Coding	Mean	Std. Deviation	P Value
RHR	Uncontrolled diabetes	90.17	9.454	0.276
	Controlled diabetes	87.03	12.40	
HbA1c	Uncontrolled diabetes	9.53	1.899	< 0.001
	Controlled diabetes	6.22	.710	
DBD	Uncontrolled diabetes	11.10	4.054	.817
	Controlled diabetes	11.40	5.769	
VR	Uncontrolled diabetes	1.07	.198	0.002
	Controlled diabetes	1.22	.148	

Table- 3: basic statistics for uncontrolled diabetic patient group and healthy control group

	Coding	Mean	Std. Deviation	P Value
RHR	uncontrolled diabetic	90.17	9.454	< 0.001
	healthy control group	68.67	7.792	
HbA1c	uncontrolled diabetic	9.53	1.899	< 0.001
	healthy control group	5.71	.428	
DBD	uncontrolled diabetic	11.10	4.054	< 0.001
	healthy control group	17.53	6.442	
VR	uncontrolled diabetic	1.07	.198	< 0.001
	healthy control group	1.25	.128	

Table- 4: Basic statistic of controlled diabetes patient group and healthy controls

	Coding	Mean	Std. Deviation	P Value
RHR	controlled diabetes	87.03	12.40	< 0.001
	healthy controls	68.67	7.792	
HbA1c	controlled diabetes	6.22	0.710	0.001
	healthy controls	5.71	0.428	
DBD	controlled diabetes	11.40	5.769	< 0.001
	healthy controls	17.53	6.442	
VR	Controlled diabetes	1.22	0.148	0.365
	healthy controls	1.25	0.128	

DISCUSSION

In present study total 36 (60%) type II diabetes patients had cardiac autonomic neuropathy. Out of 60 type II diabetes patients 16 (26.66%) patients were found to have severe cardiac autonomic neuropathy. While 20 (33.33%) had borderline CAN. out of 30 uncontrolled diabetes patients 8 had severe cardiac autonomic neuropathy while in controlled diabetes patient group also 8 patients had severe cardiac autonomic neuropathy on the contrary none of the patient in healthy control group had cardiac autonomic neuropathy

Though there is no statistically significant difference between prevalence of CAN among uncontrolled and controlled diabetes patient group ($p > 0.05$) but differences in the means of valsalva ratio is statistically significant. Valsalva ratio is deranged in uncontrolled diabetic patient group. 13 out of 30 uncontrolled diabetes patients had abnormal valsalva ratio as compared to 4 out of 30 patients in controlled diabetes patient group and only 1 out of 30 subject from healthy controls had abnormal valsalva ratio.

Mean and standard deviation of valsalva ratio (VR) (table: 1) in uncontrolled diabetes patient group, controlled diabetes patient group and healthy controls are 1.07 ± 0.198, 1.22 ± 0.148 and 1.25 ± 0.128 respectively. There is gradual decrease in mean from healthy control group to uncontrolled diabetes patient group. that means there is less variability in heart rate .with Analysis of variance (ANOVA) test among difference in valsalva ratio was statically significant ($p < 0.001$) when unpaired t test is applied to compare Uncontrolled diabetes patient group with Controlled diabetes patient group the difference in means of valsalva ratio value is found to be statistically significant (table: 2) and valsalva ratio is significantly decreased in uncontrolled diabetics. When unpaired t test between uncontrolled diabetes patient group and healthy controls was applied difference in mean was statistically significant and valsalva ratio was significantly decreased in uncontrolled diabetics compared to healthy controls ($p < 0.001$).When controlled diabetes patient group is compared with healthy controls(table: 4) there is statistically insignificant difference in the means of valsalva ratio in two groups ($P= 0.365$). The heart rate response to Valsalva maneuver depends on the integrity of sympathetic as well as parasympathetic pathways. Parasympathetic fibers being the longest fibers are affected first due to atherosclerotic changes of vasa nervosum.

Mean and standard deviation of deep breathing difference among three study groups i.e. uncontrolled diabetes, controlled diabetes and healthy controls are 11.10 ± 4.054, 11.40 ± 5.769 and 17.53 ± 6.442 respectively. ANOVA test was applied to see significance between three groups, difference between three group is statistically significant ($p < 0.001$) unpaired T test was applied to know in which two groups there is statistical significance, when uncontrolled diabetic patient group was compared with healthy controls the difference in heart rate response was statistically significant ($p< 0.001$). When deep breathing difference was compared between controlled diabetic patient group and healthy control group difference was statistically significant ($p< 0.001$). Between uncontrolled diabetic patient group and controlled diabetic patient group value of deep breathing difference is statistically insignificant though value is comparatively less in uncontrolled diabetic patient group. After comparing these results, there is gradual loss of deep breathing difference as apparent in mean

and standard deviation mentioned above this shows that there is progressive parasympathetic dysfunction in diabetics but it is more in poorly controlled diabetics. HR response to breathing is a normal phenomenon and is due to fluctuations in parasympathetic output to heart. In diabetes, loss of vagal tone (vagal denervation) is responsible for reduced heart rate response to deep breathing. Parasympathetic fibers being the longest fibers are affected first due to atherosclerotic changes of vasa nervosum. Similar results were found in studies done previously.

Abbasher Hussein et al studied presence of cardiac autonomic neuropathy in a group of adult diabetic Sudanese patients. 45% type II diabetes patients had abnormal heart rate response to Valsalva maneuver. Deep breathing difference was found to be abnormal in 90% of study population [8]. Compared to Abbasher Hussein et al present study has lower number of patients having abnormal valsalva ratio (28.33%) and deep breathing difference (40%).

V. Nagalakshmi et al did a study in 2016 on diabetes and cardiac autonomic neuropathy they found prevalence of CAN in diabetics was 16%. As compared to V. Nagalakshmi et al present study has higher prevalence of CAN (60%) [9].

Various mechanisms are responsible for development of diabetic autonomic neuropathy such as hyperactivity of polyol pathway, activation of protein kinase C formation of advanced Glycation end products and oxidative stress Both sympathetic and parasympathetic fibers are affected with parasympathetic dysfunction preceding sympathetic dysfunction.

Chronic hyperglycemia causes hyperactivity in polyol pathway leading to activation of sorbitol and accumulation of fructose. This pathway ultimately cause neuronal damage and decrease neuronal blood flow Uncontrolled diabetes leads to stimulation of Diacylglycerol (DAG) and protienkinase C these together leads to impaired gene expression and neuronal cell death via activation of mitogen activated protein kinases (MAPKs)

Advantage of using resting tachycardia, deep breathing difference and valsalva ratio for assessment of cardiac autonomic neuropathy is that these tests are extremely easy to perform bedside and are reproducible. These tests can be applied to assess cardiac autonomic function of diabetic patients in outpatient as well as inpatient department. Limitation of present study is limited sample size and cross sectional study design. Studies with larger sample size are immediately needed in this region to detect cardiac autonomic neuropathy and prevent associated morbidity and mortality in type II diabetes patients.

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Correlation of FEV1, FVC, & FEV1/FVC % with Body Fat Percentage in College Students of Dharwad City

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ABSTRACT

Background- Obesity is a growing problem even in developing regions like India. Obese people are also at risk for social discrimination and possibly adverse psychological consequences. **Objective**: to study dynamic lung functions and flow rates Forced Expiratory Volume (FEV), Forced Ventilatory Capacity (FVC), FEV1/FVC ratio on subjects and controls. **Methods**- The study was conducted in the Department of Physiology, SDM College of medical sciences and hospital, Dharwad. 150 male students in the age group 15-24 years of the college formed the subjects of the study. **Results**- The mean (±SD) body mass index in overweight group was 23.94 ± 0.55kg/m^2, in obese group was 26.81 ± 1.45kg/m^2 and in controls was 21.04 1.26 kg/m^2. The mean (±SD) age in overweight group was 20.44 ± 1.83 years, in obese group was 20.60 ± 1.78 years and in controls was 19.90 ± 1.31years. The mean (± SD) forced vital capacity at rest in overweight group was 3.54 ± 0.37 litres, in obese group was 3.53 ± 0.76 litres and in controls was 3.82 ± 0.46 litres. The mean (± SD) FEV_1 at rest in overweight group was 3.11 ± 0.40 litres, in obese group was 3.10 ± 0.73 litres and in controls was 3.43 ± 0.5 litres. The mean (± SD) FEV_1/FVC at rest in overweight group was 0.87 ± 0.37 %, in obese group was 0.87 ± 0.03% and in controls was 0.89 ± 0.06%.

Conclusion- FEV_1 and FVC were significantly lower in overweight and obese groups compared to controls. FEV_1 was reduced more significantly than FVC. But there is no significant change in FEV_1/FVC ratio in overweight and obese groups.

Keywords*: Forced Vital capacity (FVC), Forced Expiratory Volume in first second (FEV_1), FEV_1/FVC, BMI*

INTRODUCTION

Physiologic system, orchestrated through endocrine and neural pathways, permits humans to survive starvation for as long as several months[1]. However in the presence of nutritional abundance and a sedentary life style, & influenced importantly by genetic endowment, this system increases adipose energy stores resulting in obesity that produces adverse health consequences[2]. Adipose tissue accounts for about 20% of the total body weight of a normal young adult, about 15kg in the average person.

The WHO consultation on obesity, Geneva interim report on "obesity-preventing and managing the global epidemic1997: has recognized that overweight and obesity represent a rapidly growing threat to the health of population worldwide. It recognized obesity as a disease, which is prevalent in both developing and developed countries and affects children and adults alike. Indeed obesity and overweight are so common that they are replacing the more traditional public health concern such as under nutrition and infectious diseases as some of most significant contributes to ill health.

There are different measures to assess obesity. One of the most commonly used is Body Mass Index (BMI)

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which is a measure of general obesity[3]. Indices used to measure regional and central obesity are subscapular skin fold thickness, waist circumference and abdominal sagittal diameter and ratios like Waist-Hip ratio (WHR). These have been considered as better and more sensitive than BMI[4].

On the other end of the spectrum purely mechanical consequences of obesity like various forms of hypoventilation syndrome and dramatic reduction in various lung volumes have also been established[5]. Hence the present study is taken up to study dynamic lung functions and flow rates Forced Expiratory Volume (FEV), Forced Ventilatory Capacity(FVC), FEV1/FVC ratio on subjects and controls

MATERIALS AND METHOD

The study was conducted under the auspices of the laboratory set up of the Department of Physiology, SDM college of medical sciences and hospital, Dharwad. 150 male students in the age group 15-24 years of the college formed the subjects of the study with applying exclusion criteria i.e Those with history of smoking or atopy, asthama, BMI <18.5 or >29.9, History or family history of asthama, Congenital cardiopulmonary disease and age <15 or >25 years

These subjects were divided into three groups based on BMI as follows.

GpI (Controls) : 50 controls BMI 18.5-22.9(age and sex matched)

Gp-II (Overweight) : 50 students with BMI 23-24.9

Gp-III (Obese) : 50 students with BMI 25-29.9[3]

Method of data collection: Identification data name, age, sex and address were recorded. Age was calculated in years to the nearest birthday. Height and weight of each subject was recorded. BMI (Body Mass Index) was calculated using the formula BMI = Weight in Kg. / [Height in m]^2

- A detailed clinical examination of Respiratory, Cardio-Vascular and Central Nervous Systems was done.

- Skinfold thickness was measured at chest, abdomen, thigh regions using skin fold callipers, body fat percentage is calculated using Jackson and pollock's formula.

o Three skinfold sites (chest, abdoman and thigh sites from above, SUM3 is the sum of these sites in mm)

o Bone Density = 1.1093800 - (0.0008267 * SUM3) + (0.0000016 SUM3^2) - (0.0002574 Age)

o Body Fat Percentage = [(4.95/Bone Density) - 4.5] 100

- Lung Function Tests were recorded using Spirovit SP-1.

Spirovit SP-1:

The instrument used in this study was Spirovit SP1 manufactured by Schiller. Its a type of flow sensing Spirometer. This is a low cost high performance instrument capable of giving highly accurate and repeatable test results and represents the major advancement in computerized pulmonary function testing. It is best instrument for routine screening of large number of subject.

a. Forced Vital Capacity (FVC)

b. Forced Expiratory Volume in First Second (FEV_1)

c. Forced Expiratory Volume in first second to FVC ratio (FEV1/FVC)

Procedure: All maneuvers were performed in sitting position and at rest with the nose clip in place. The subject was asked to loosen tight clothing, if any. Each student was taught about the various maneuvers to be performed for about 5 minutes. Demonstration was also given. Every subject was given ample time to understand carefully and then was allowed to do some practice blows. Sufficient rest was provided between the procedures. Given below are the ways in which the subject was instructed to perform the three maneuvers.

o **FVC maneuver** – A disposable card board mouth piece was placed in the pneumotachograph. The 'FVC' button on the menu pad was pressed (with the sensor still on the stand). After sufficient rest was given the subject was asked to place the mouth piece properly. The start/stop button was pressed and the subject was asked to inhale completely and then exhale it forcefully

and completely, this was followed by another complete inhalation, then the start/stop key was pressed again to stop the test. This test has three memories. The LCD screen displays both the PFT parameter results, as well as the flow volume loop.

Table no.1: Interpretation of Spirometry values[6]

Parameters	Restrictive	Obstructive
FVC	< 80% of predicted	Normal or < 80% of predicted
FEV_1	Normal or < 80% of predicted	< 80% of predicted
FEV_1/FVC	≥ predicted	< predicted

o According to recommendations of global initiative for COPD, FEV_1/FVC of 70% or less is defined as obstructive lung diseases**.**

o These values (FVC, FEV_1, FEV_1/FVC) were compared with average predicted for a subject on the basis of age, sex, built and race[7]

o In both the groups (test and control) subjects were highly motivated and cooperative. They performed the tests with care and maximum efforts.

Statistical analysis: Following statistical methods were employed in the present study using SPSS-20. Anova - Compares mean values of more than two groups. Correlation analysis

Findings**:** The Anthropometric data in overweight, obese and controls are shown in table 2.

Table 2. Anthropometric data of controls, oveweight and obese groups

Parameter	Control Mean ± SD (n=50)	Overweight Mean ± SD (n=50)	Obese Mean ± SD (n=50)	'p' value	Significance
Age(yrs)	19.90 ± 1.31	20.44 ± 1.83	20.60 ± 1.78	0.090	NS
Height(cm)	170 ± 7.2	170 ± 6.1	168 ± 6.1	0.121	NS
Weight(kg)	60.80 ± 4.84	69.44 ± 4.35	75.72 ± 8.11	0.000	S
BMI(kg/m^2)	21.04 ± 1.26	23.94 ± 0.55	26.81 ± 1.45	0.000	S
WHR	0.83 ± 0.03	0.86 ± 0.028	0.85 ± 0.04	0.000	S
BFP	19.11 ± 3.77	24.13 ± 1.95	26.35 ± 3.74	0.000	S

The mean (±SD) age in overweight group was 20.44 ± 1.83 years, in obese group was 20.60 ± 1.78 years and in controls was 19.90 ± 1.31years. The mean (±SD) height in overweight group was 170 ± 6.1cms, in obese group was 168 ± 6.1cms and in controls was 170 ± 7.2cms. There was no statistically significant difference of age and height between the three groups.

Weight: The mean (± SD) weight in overweight group was 69.44 ± 4.35 kgs, in obese group was 75.72 ± 8.11 kgs and in controls was 60.80 ± 4.84kgs. As BMI is the basis of division all three groups, they have significantly increasing weight with increasing BMI.

Body Mass Index (BMI): The mean (±SD) body mass index in overweight group was 23.94 ± 0.55kg/m^2, in obese group was 26.81 ± 1.45kg/m^2 and in controls was 21.04 ± 1.26 kg/m^2. As BMI is the basis of division so all three groups have significantly different BMI.

Waist Hip Ratio (WHR): The mean (±SD) waist hip ratio in overweight group was 0.86 ± 0.028, in obese group was 0.85 ± 0.04 and in controls was 0.83 ± 0.03. WHR is significantly more in obese and overweight groups compared to controls.

Body Fat Percent (BFP): The mean (±SD) body fat percent in overweight group was 24.13 ± 1.95 %,

in obese group was 26.35 ± 3.74 % and in controls was 19.11 ± 3.77%. BFP is significantly more in obese and overweight groups compared to controls and also in obese group compared to overweight group.

Dynamic Lung Function: FVC parameters of Controls, overweight and obese groups are shown in Table 3.

Table 3. Dynamic lung function of controls, overweight and obese groups

Parameters	Control Mean ± SD (n=50)	Overweight Mean ± SD (n=50)	Obese Mean ± SD (n=50)	'p' value	Significance
FVC (L)	3.82 ± 0.46	3.54 ± 0.37	3.53 ± 0.76	0.017	S
FEV1 (L)	3.43 ± 0.54	3.11 ± 0.40	3.10 ± 0.73	0.007	S
FEV1/FVC (%)	0.89 ± 0.06	0.87 ± 0.37	0.87 ± 0.03	0.081	NS

Forced Vital capacity (FVC): The mean (± SD) forced vital capacity at rest in overweight group was 3.54 ± 0.37 litres, in obese group was 3.53 ± 0.76 litres and in controls was 3.82 ± 0.46 litres. FVC was significantly less in overweight and obese groups compared to controls.

Forced Expiratory Volume in first second (FEV_1): The mean (± SD) FEV_1 at rest in overweight group was 3.11 ± 0.40 litres, in obese group was 3.10 ± 0.73 litres and in controls was 3.43 ± 0.5 litres. FEV_1 was significantly less in overweight and obese groups compared to controls table 4.

Table 4. Correlation of WHR with PFT

Parameters	"r" value	"P"value
FVC (L)	- 0.228	0.005*
FEV1 (L/min)	- 0.262	0.001*
FEV1/FVC (%)	- 0.225	0.006*

FEV_1/FVC: The mean (± SD) FEV_1/FVC at rest in overweight group was 0.87 ± 0.37 %, in obese group was 0.87 ± 0.03% and in controls was 0.89 ± 0.06 %. There was no statistically significant difference among three groups.

DISCUSSION

Forced Vital capacity (FVC): The mean (± SD) forced vital capacity at rest in overweight group was 3.54 ± 0.37 litres/sec, in obese group was 3.53 ± 0.76 litres/sec and in controls was 3.82 ± 0.46 litres/sec. FVC was significantly less in overweight and obese groups compared to controls. FVC tend to decrease with increasing BMI[8,9]. However, the effect is small, and both FEV1 and FVC are usually within the normal range in healthy, obese adults[10].

Forced Expiratory Volume in first second (FEV_1): The mean (± SD) FEV_1 at rest in overweight group was 3.11 ± 0.40 litres/sec, in obese group was 3.10 ± 0.73 litres/sec and in controls was 3.43 ± 0.5 litres/sec. FEV_1 was significantly less in overweight and obese groups compared to controls. FEV1 tend to decrease with increasing BMI[8, 9]. However, the effect is small and both FEV1 and FVC are usually within the normal range in healthy, obese adults[8] and children[10].

FEV_1/FVC: The mean (± SD) FEV_1/FVC at rest in overweight group was 0.87 ± 0.37, in obese group was 0.87 ± 0.03 and in controls was 0.89 ± 0.06. There was no statistically significant difference among three groups. Both FEV_1 and FVC were similarly reduced (in terms of percentage predicted), the FEV_1 to FVC ratio was normal and static lung volumes were reduced, suggesting the reduction may be due to restriction as opposed to air flow obstruction[11]. The FEV1 to FVC ratio is usually well preserved or increased[12,9,] even in morbid obesity [13] , indicating that both FEV1 and FVC are affected to the same extent[10]. The normal FEV1/FVC ratio in our study may also indicate that the inspiratory and expiratory muscle strength is normal[13].

FVC and FEV1 results are consistent with previous studies done by Helena Santana et.al[14], senmann[15], both FEV1 and FVC are the lung functions most closely related to body composition and fat distribution. It has been also stated that increase in adult body mass is a predictor of FEV1 decline[8]. The normal FEV1/FVC ratio in our study indicates that the inspiratory and expiratory

muscle strength is normal[13]. Both FEV_1 and FVC were similarly reduced (in terms of percentage predicted), the FEV_1 to FVC ratio was normal and static lung volumes were reduced, suggesting the reduction may be due to restriction as opposed to air flow obstruction[11].

FEV1 and FVC, tend to decrease with increasing BMI[8,9] . However, the effect is small, and both FEV1 and FVC are usually within the normal range in healthy, obese adults [8] and children. The FEV1-to-FVC ratio is usually well preserved or increased[8] even in morbid obesity1[9], indicating that both FEV1and FVC are affected to the same extent. This finding implies that the major effect of obesity is on lung volumes, with no direct effect on airway obstruction.

Lazarus et al[20] found that the FEV_1 to FVC ratio decreases with increasing BMI in overweight and obese individuals. In morbidly obese subjects (defined as individuals with a body weight (in kilograms) to height (in centimetres) ratio greater than 0.9 (in kg/sqcm), Biring et al[19] found a reduction in midexpiratory flows and the FEV_1 to FVC ratio. Therefore, it appears that spirometric abnormalities in patients with mild to moderate obesity represent a restrictive defect placed on the system whereas with severe and morbid obesity, it represents true air flow obstruction. The mechanism may be related to small airway collapse due to decreased lung volumes with increasing obesity or it may be independent[11].

CONCLUSION

Dynamic lung volumes (FEV_1 and FVC) were significantly lower in overweight and obese groups compared to controls. FEV_1 was reduced more significantly than FVC. But there is no significant change in FEV_1/FVC ratio in overweight and obese groups.

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Ethical Clearance*:* Permission for the study was obtained from the College authorities prior to commencement.

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Study to Assess Iodine Status in Pregnant Women

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ABSTRACT

Background: Pregnancy is associated with substantial changes in thyroid physiology and represents a major stress on maternal iodine homeostasis leading to an increased requirement of iodine. The fetus is particularly vulnerable and maternal iodine deficiency can cause irreversible cognitive and motor deficits.

Objectives: The main objective of the present study was to assess the iodine status of pregnant women and to know the prevalence of iodine deficiency in them.

Materials and Method: A Cross-sectional, observational, hospital based study was done in normal, healthy pregnant women. Pregnant women, who were in their first (n=60) and third (n=60) trimesters were selected. Age matched healthy non pregnant women served as control group (n=60). Urine Iodine Concentration (UIC) and Serum Thyroid Stimulating Hormone (TSH) levels were determined. The cut off values for iodine nutrition sufficiency as defined by WHO/UNICEF/ICCIDD guidelines were used.

Results and Discussion: The results obtained showed that the values of Urine Iodine Concentration in third trimester pregnant women were significantly less ($P<0.05$) compared to first trimester women. Increased hormonal and metabolic demands may lead to depletion of total body iodine stores which if not compensated by adequate dietary iodine intake is reflected by decreasing levels of UIC with increase in gestational period. The serum TSH values in third trimester pregnant women were significantly high ($P<0.05$) compared to first trimester and non pregnant women reflecting increased thyroidal stimulation. The study also documented the negative correlation between maternal TSH and UIC.

Conclusions: The findings of the present study indicates that Pregnant women tend to become more iodine deficient as pregnancy advances. So, monitoring of iodine nutrition status during pregnancy is essential, to plan and evaluate adequate interventions either in the form of specific dietary care or therapeutic iodine supplementation.

Keywords : *Pregnant women, Iodine status, UIC, TSH*

INTRODUCTION

Iodine deficiency is the easiest of the nutritional deficiencies to correct and the most preventable cause of mental retardation. Iodine requirement varies with physiological states and the nutritional needs for iodine are increased, as any other nutrient during pregnancy, as it is associated with substantial changes in thyroid physiology. During pregnancy circulating TBG levels increase[1] 1.5 fold, increasing the levels of circulating total T3 and T4 and requiring an increase in thyroid hormone production to maintain normal unbound thyroid hormone levels. Additionally, in early gestation, the thyroid gland is stimulated not only by TSH but by the alpha subunit of human chorionic gonadotropin (hCG), which also binds to and stimulates the TSH receptor[2].

Also there is significant increase in renal clearance of iodide because of increased maternal glomerular filtration rate[3] during pregnancy and Urine iodine excretion being a passive process is dependent on glomerular filtration rate (GFR)[4]. Fetal thyroid is capable of organifying iodine by approximately the 20th week of gestation. Before this the maternal T4 traverse the placenta in small amounts to meet the metabolic

needs of the fetus and even after the fetal thyroid gland function is established, the fetal iodine requirement depends exclusively on maternal intake.

These hormonal changes and metabolic demands require an increase in thyroid hormone production that depends directly upon the availability of iodine and consequently requirements of iodine are increased to maintain normal metabolism. When dietary iodine is lacking it results in impaired thyroid hormone synthesis and an adequate physiological adaptation is difficult to achieve and is progressively replaced by pathological alterations that occur in parallel with the degree and duration of iodine deficiency.

Thyroid hormones are also a key regulator in the process of early growth and development of most organs, especially of the brain, which occurs in humans during fetal and early postnatal life. They affect brain maturation through specific effects on cell differentiation and play an essential role in neuronal migration, myelination, synaptic transmission and plasticity[5,6]. Therefore severe iodine deficiency during this critical period, may result in adverse effects on the fetus including congenital anomalies, decreased intelligence, and neurological cretinism[7]. Even mild to moderate iodine deficiency during pregnancy can result in mild intellectual blunting that may go unrecognised or may present with attention deficit hyperactivity disorders in offspring.

Severe maternal iodine deficiency in pregnancy is associated with poor obstetric outcomes including spontaneous abortion, prematurity, and stillbirth[7]. So, maternal Iodine status remains critical for optimal development of the fetus and to prevent adverse maternal and neonatal outcomes which are generally irreversible but preventable. Monitoring of adequacy of iodine nutrition of school-age children or non pregnant women may not indicate adequate iodine nutrition among pregnant women and they should be directly monitored.

The World Health Organization[8] recently increased their recommended iodine intake during pregnancy from 200 to 250 µg/d. The American Thyroid Association[9] (ATA) recommends a supplement of 150µg iodine/ day during pregnancy and lactation in addition to the use of iodised salt. Though there are limited studies specific to the iodine status of pregnant women in India but the weighted results from those available suggest inadequate intake.

MATERIALS AND METHOD

An Observational, Cross sectional study was done in 180 subjects. Normal healthy pregnant women attending antenatal outpatient department of Government Maternity Hospital in their first and third trimesters and without any disease or pregnancy related complications were included. Those with any chronic disease or any thyroid disorder or on iodine supplementation or any pregnancy related complication were excluded. Age matched non pregnant women were taken as controls. The study subjects were divided into three groups of 60 each.

Institutional Ethics committee approval was obtained prior to study. Informed written consent was taken from the subjects. The study included a questionnaire by which their personal information, obstetric history, history of any chronic illness or thyroid disorders, use of supplements and dietary habits were documented. For assessment of iodine nutrition status they were evaluated clinically for the presence of goitre and urine samples were collected for the determination of UIC and blood samples were collected by venipuncture to determine Serum TSH levels.

Measurement of urinary iodine is the most common and universally accepted measure to monitor dietary iodine intake. The World Health Organization (WHO)/International Council for the Control of Iodine Deficiency Disorders/United Nations Children's Fund (UNICEF) recommend median UIC as the primary tool for assessment of iodine status in pregnant populations[7]. Because serum TSH is determined mainly by the level of circulating thyroid hormone, which in turn reflects iodine intake, TSH can be used as an indicator of iodine nutrition.

The iodine in the urine was measured by a modification of the traditional colorimetric method using ammonium persulphate of Sandell and Kolthoff[10]. The cut off values for iodine nutrition sufficiency for the studied indicators as defined by WHO/UNICEF/ ICCIDD guidelines were used[11]. Estimation of serum TSH levels was done in the hospital laboratory using ELISA method by a commercially available kit. The limits of detection were first trimester- 0.3 to 4.5 µlU/ml, second trimester - 0.5 to 4.6 µlU/ml and third trimester - 0.8 to 5.2 µlU/m.

Statistical Analysis - Quantitative variables were described as Mean ± SD and qualitative variables as frequency percentages (Tables 1 - 2). Statistical analysis was performed using Statistical Package for Social Sciences (SPSS Inc., Chicago, USA) software version 18.0. for windows. The data was analysed by One Way Analysis of Variance (ANOVA) /Welch/ Brown-Forsythe test after testing for the significance of Levene's test of Homogeneity of variances. Multiple comparisons were done by Tukey's HSD and Tamhane's Post Hoc tests. P values less than 0.05 were considered statistically significant. Pearsons Correlation coefficient was computed to assess correlation between UIC and serum TSH levels. P values less than 0.01 were considered statistically significant.

RESULTS

On clinical examination none of the subjects were found to have goitre.

Table-1 - Shows the Mean ± SD and Median values of demographic characteristics [Age and Weight] and biochemical parameters [UIC and Serum TSH] of all the three study groups.

GROUPS	Number of Subjects	Age (years) Mean ± SD (Median)	Weight (kg) Mean ± SD (Median)	Urinary Iodine Concentration (µg/L) Mean ± SD (Median)	Serum TSH (µIU/ml) Mean ± SD) (Median)
Pregnant women (first trimester)	60	22.88 ± 2.75 (22)	55.57 ± 3.08 (56)	159.17 ± 23.37 (164)	0.75 ± 0.42 (0.65)
Pregnant women (third trimester)	60	23.28 ± 2.62 (23)	65.87 ± 3.63 (66)	132.08 ± 39.90 (152)	2.80 ± 1.53 (2.45)
Control	60	23.17 ± 2.57 (23)	55.67 ± 2.97 (56)	145.02 ± 16.92 (145)	0.63 ± 0.21 (0.60)

Table - 2 - Depicts the distribution of urinary iodine concentration among the three groups based on median UIC[11].

GROUPS	Number of Subjects	Mild *(50 – 99 µg/l) (50 – 149 µg/l) Number of subjects (%)	Moderate (20 – 49 µg/l) Number of subjects (%)	Severe (< 20µg/l) Number of subjects (%)	Sufficient *(100 – 199 µg/l) (150 – 249 µg/l) Number of subjects (%)
Pregnant women (first trimester)	60	5 (8.33)	1 (1.66)	-	54 (90)
Pregnant women (third trimester)	60	19 (31.66)	2 (3.33)	2 (3.33)	37 (61.66)
*Control	60	1 (1.66)	-	-	59 (98.33)

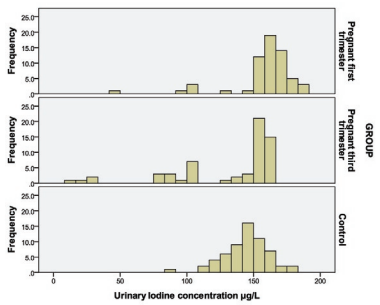

Figure-1 -

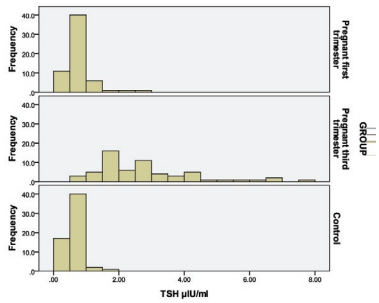

Figure-2 -

Frequency distribution of UIC in all the three groups. Frequency distribution of TSH levels in all the three groups.

The results obtained showed that the Mean ± SD and Median values of Urine Iodine Concentration in third trimester pregnant women were less compared to first trimester pregnant women and the values in first trimester pregnant women were raised compared to controls. ANOVA showed these differences to be highly significant (0.000).

The results have also shown that the Mean ± SD and Median values of serum TSH in third trimester pregnant women were high compared to those of first trimester pregnant women and non pregnant women. ANOVA showed these differences to be highly significant (0.000). Correlation between UIC and serum TSH was done by Pearson's correlation. They were found to be negatively correlated and the correlation was highly significant (0.000).

DISCUSSION

Pregnancy is associated with changes in thyroid physiology due to a complex combination of factors specific to the pregnant state and represents a major stress on maternal iodine homeostasis leading to an increased requirement of iodine. Adequate dietary iodine intake during pregnancy is essential to prevent adverse maternal and neonatal outcomes. The aim of the present study was to assess iodine nutrition status of pregnant women and to compare it with healthy non pregnant women. Urinary Iodine Concentration (UIC) and serum TSH levels were determined in all the subjects.

The study documented the impact of different stages of gestation on UIC. The lower Mean ± SD and Median values of UIC in third trimester pregnant women compared to first trimester pregnant women suggest decreasing levels of UIC with advancing gestation. The results are consistent with the earlier studies done by others[12,13]. The GFR related increased renal iodide loss, increased thyroidal iodine uptake as well as the iodine shift from the maternal circulation to the growing fetus may lead to depletion of total body iodine stores, which if not compensated by adequate dietary iodine is represented by continuous decrease of UIC over the course of pregnancy.

The raised Mean ± SD and Median values of Urine Iodine excretion in first trimester pregnant women compared to controls could be due to increased glomerular filtration rate, causing increased renal iodine clearance during early gestation. The findings are consistent with other studies done in other parts of the world[14,15].

The significantly high Mean ± SD and Median values of serum TSH in third trimester pregnant women compared to those of first trimester pregnant women and non pregnant women suggest thyroidal stimulation. The study brings to notice that thyroid function testing early in gestation as advised routinely is only partly effective in identifying thyroid dysfunction in pregnant women, because maternal thyroid function may be effected even later in gestation and inadequate iodine intake may go unnoticed.

The study elucidated the pregnancy related changes in the iodine metabolism and thyroid function in pregnant women and also documented the correlation between maternal thyroid function in relation to maternal iodine status during the course of pregnancy and found it to be negatively correlated and the correlation was found to be significant. These changes reflect the possible iodine deficiency and the consequent low thyroidal activity during normal pregnancy indicated by relative hypothyroidism.

The study was done to know the prevalence of iodine deficiency in pregnant women and to compare their iodine status with non pregnant women living in the same area. The data suggest that the control population has no iodine deficiency as 98.33% of them were found to have optimal iodine nutrition. As the study group is also taken from the same area, the control group could be a representative of the prepregnant state of the pregnant women retrospectively as on clinical examination also none of the subjects were found to have goitre, an indicator of long term iodine deficiency, thus ruling out the possibility of any geographical influence or use of non iodized salt as the cause of iodine deficiency.

In this study the percentage of pregnant women falling below the recommended criteria of iodine sufficiency of >150 µg/L, increased from 10% in first trimester to 38.33 % in third trimester reflecting iodine intake to be inadequate to meet the increasing demands. This study is complementary to the similar studies done on iodine status done in other parts of the world and in India[16].

CONCLUSION

Stratification by gestation, revealed a dynamic relationship between ioduria and gestation. Median UIC was elevated in early pregnancy due to increased glomerular filtration rate and subsequently declined as the gestation period increased reflecting physiological alterations in normal pregnancy leading to depletion of total body iodine stores not been compensated by adequate dietary iodine ingestion.

The use of the same standard reference criteria for assessment of iodine nutrition based on the median UIC for all the three trimesters is inappropriate and gestation specific UIC reference intervals are required to classify iodine nutrition during pregnancy.

The findings of the present study emphasize the importance of monitoring and recommend routine evaluation of the iodine status of pregnant women to be made mandatory as a part of antenatal care to plan and evaluate adequate timely interventions either in the form of specific dietary care or therapeutic iodine supplementation to meet the increased demand of iodine as a result of the pregnancy. Trimester-specific changes in maternal thyroid hormone and TSH during gestation suggest that their measurement to be done in each trimester.

Considering the fact that salt fortification of iodine alone may not be sufficient to meet the increased iodine requirement during pregnancy, there is a need to explore alternate methods. This study points out the potential role of iodine supplementation to ensure adequate thyroid hormone levels in all pregnant women. The study can be done on a larger sample size and complemented by measuring T3, T4 and Thyroglobulin levels for improving objectivity of tests.

Conflicts of Interest – The Authors Declare No Conflict Of Interest.

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Study of the Sleep Quality among the Undergraduate Medical Students

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ABSTRACT

Aims and Objectives: This study was conducted to assesss the quality of sleep among undergraduate medical students.

Materials and Method: This work is a cross-sectional questionnaire-based study conducted at VIMS , Pawapuri during the month of Januaury in 2017 .The participants in this study were 307 undergraduate M.B.B.S students of the 1st,2nd ,3rd and 4th academic year of this college . A self-administered questionnaires were distributed to the students which collected information regarding participants'age, gender,habitat ,physical activity ,body mass index, addictions, year of study, residence and background , Pittsburg sleep quality index (PSQI) score and Epworth sleepiness scale .

Result A total of 307 responses with a rate of 80% were obtained . According to the PSQI score, 67.42% of participants were considered to have abnormal sleep quality , with a statistically significant increase in female students ($P < 0.05$) and those having daytime sleepiness (ESS >10) ($P<.0001$).

Conclusions: A very high prevalence of poor sleep quality was found among the medical students specifically among female students. There was a significant relationship of abnormal PSQI scores with female students ($P < 0.05$) and those having daytime sleepiness ($P<.0001$).

Keywords:, *Medical Students, Pittsburgh Sleep Quality Index(PSQI), Sleep Quality, Epworth Sleepiness Scale (ESS)*

INTRODUCTION

Sleep is serves a restorative homeostatic function and appears to be crucial for normal thermoregulation and energy conservation [(1).] Sleep deprivation and symptoms related to sleep disorders have not only been ignored but also inadequately understood. The prevalence of sleep disorders in the general population has been estimated to be 15% -- 35% [2,3.]. Medical students are especially vulnerable to poor sleep, perhaps due to the long duration and high intensity of study, clinical duties that include overnight on-call duties, work that can be emotionally challenging, and lifestyle choices[(.4)]

Research on sleep disturbances in undergraduate medical students is of particular interest because of the known relationship between sleep and mental health[(5)] and the concern that the academic demands of medical training can cause significant stress[(6,7)]. A large body of evidence supports the notion that good quality sleep is important for optimal neurocognitive and psychomotor performance as well as physical and mental health[(8)]

Many factors determine sleep quality, and some of the important ones are age,gender, habitat, body mass index (BMI), physical activity or sports, smoking[(9)]. Recent studies have demonstrated that the sleep–wake cycle of medical students is characterized by insufficient sleep duration, delayed sleep onset, and occurrence of napping episodes during the day[(10, 11)] which has been found to affect cognitive function in medical students[(12).]

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Moreover, multiple studies have indicated a high correlation between sleep duration and performance in some activities and in subjective alertness [13, 14]..

Despite inherent importance of sleep, there is limited information about sleep behavior and sleep disturbances in medical college students[15].This study was designed to assess the quality of sleep among the undergraduate medical students.

METHODOLOGY

STUDY DESIGN

This cross-sectional study was conducted at VIMS in Pawapuri during the month of Januaury in 2017 .The participants in this study were 307 undergraduate M.B.B.S students of the 1st,2nd ,3rd and 4th academic year of this college . Among them, 72 were female and 235 were male. Students who were willing to participate were given a brief description about the study and its aims & objectives. Verbal consent of each student was taken and were assured about the confidentiality . Students with chronic diseases or sleep disorders were excluded . The ethics committee of the institute approved the study. Recruitment and collection of data continued for four weeks in the month of January A self-administered questionnaires were distributed to the students which collected information regarding participants'age, gender,habitat ,physical activity ,body mass index, addictions, year of study, residence and background , Pittsburg quality of sleep index (PQSI) score and Epworth daytime sleepiness scale (ESS).The recruitment and collection process was carried out under the supervision of the authors and the help of 10 previously trained senior medical students . After completion, the questionnaires were collected from the students and the incomplete ones were removed from the study.

The analysis was performed using Graphpad instat prism 6. T-test was then used for processing quantitative information and chisquare test for the qualitative information. Statistical significance was accepted at $P<0.05$. .

Instrumental tools used in the study

Pittsburg Sleep quality Index (PSQI)[16] It is a self report instrument to assess the quality of sleep. The Pittsburgh sleep quality index (PSQI), a self-rated questionnaire that assesses sleep quality over a time interval was adopted in the survey. Seven properties of sleep were evaluated by this questionnaire:

1. Sleep quality of the individual
2. Time it takes for an individual to sleep
3. Duration of sleep
4. Sleep efficiency
5. Bedtime problems
6. Use of sleeping medication
7. Impairment in daily functioning

The scores for each question range from 0 to 3, with 0 indicating the highest sleep quality and 3 indicating the lowest one. The seven component scores are then added to yield a global PSQI score in the range of 0 to 21; the higher the score is, the worse the sleep quality. A global score equal or greater than 5 indicates poor sleep quality in the past month.

Epworth Sleepiness Scale (ESS)[17]: It is a scale intended to measure daytime sleepiness that is measured by use of a very short questionnaire. This can be helpful in diagnosing sleep disorders. It was introduced in 1991 by Dr. Murray Johns of Epworth Hospital in Melbourne, Australia. The questionnaire asks the subject to rate his or her probability of falling asleep on a scale of increasing probability from 0 to 3 for eight different situations. The scores for the eight questions are added together to obtain a single number. A number in the 0-9 range is considered to be normal while the numbers 10 and 11 are border line and 12-24 range indicates that expert medical advice should be sought.

RESULT

A total of 307 responses were obtained of which 67.42 % were considered poor sleepers. The mean age of the participants, which ranged from 17 to 24 years, was 20.54 . Among this population, 235 (76.54%) were male and 72 (23.45%) were female. The students were distributed among the four academic years. Daily sleeping hours of 4 - 6 hours were reported by 213 (69.38 %) of the participants and 7 - 10 hours by 66 (21.49%). A small numbers of students 28(9.12%) slept less than 4 hours or more than 10 hours . Among the students, 100 (32.54%) had normal PSQI scores and 207 (67.42%)

had PSQI > 5 scores.indicating poor quality.

Daytime sleepiness was assessed using the ESS. The ESS is a standardized validated subjective way to assess daytime sleepiness. 193 students had ESS <10 while 114 (37%) students had ESS >10 indicating increased daytime sleepiness among them.

Table 1 presents the complete demographic characteristics and other study variables.Table 2 presents the analysis of the study variables with PSQI scores. A multivariate analysis of sleep disturbance and other study variables revealed that girls had poorer sleep quality than boys. sleep quality also had a significant relationship with , habitat, sleeping hours and daytime sleepiness . The prevalence of sleep disorders was higher among day scholars (90.1%) as compared to those who lived in the hostel .Sleep quality was significantly poor among students having ESS>10. 114 students had daytime sleepiness of which 91.2% had poor quality which was very significant (p<.0001).However sleep quality was not significantly associated with the academic year and the body mass index of the students .

Table 1: Demographic Characteristics and Other Variables of the Study Population

Variables		NO(%)
GENDER	MALE	235 (76.5)
	FEMALE	72 (23.4)
Academic year		
	FIRST	90(29.3)
	SECOND	72(23.4)
	THIRD	61 (19.9)
	FOURTH	84 (27.4)
HABITAT		
	HOSTEL	274 (89.3)
	HOME	33 (10.7)
BMI		
	<18.5	61(19.9)
	18.5-24.9	135 (44)
	25- 29.9	73 (23.8)
	>30	38 (12.4)
SLEEP HOURS		
	4-6	213 (69.4)
	7-10	66 (21.5)
	OTHERS	28 (9.1)
PSQI		
	<5 (NORMAL)	100 (32.6)
	≥ 5 (ABNORMAL)	207(67.4)
ESS		
	<10(NORMAL)	193 (62.9)
	≥10 (ABNORMAL)	114 (37.1)

Table 2. Analysis of PSQI Scores With Other Study Variables

VARIABLES		PQSI < 5	PQSI ≥ 5	TOTAL	P VALUE
SEX					<.05
	MALE	84 (35.74)	151(64.26)	235	
	FEMALE	16 (22.22)	56(77.77)	72	
ACADEMIC YEAR					>.05
	FIRST	24 (26.66)	66 (73.33)	90	
	SECOND	29 (40.28)	43(59.72)	72	
	THIRD	28(45.90)	33 (54.1)	61	
	FOURTH	19(22.62)	65(77.38)	84	
HABITAT					<.05
	HOSTEL	97 (35.4)	177 (64.5)	274	
	HOME	3 (9.1)	30 (90.1)	33	
BMI					>.05

Cont... **Table 2. Analysis of PSQI Scores With Other Study Variables**

	< 18.5	21(34.4)	40 (65.6)	61	
	18.5 – 24.9	36(26.7)	99 (73.3)	135	
	25 – 29.9	27 (37)	46 (63)	73	
	>30	19 (50)	19 (50)	38	
SLEEP HOURS(in hrs)					<.05
	4-6	55 (25.8)	158 (74.2)	213	
	7 -10	28 (42.4)	38 (57.6)	66	
	OTHERS	17(60.7)	11 (39.3)	28	
ESS					<.0001
	<10 (NORMAL)	90 (46.6)	103 (53.4)	193	
	>10 (ABNORMAL)	10 (8.8)	104 (91.2)	114	

DISCUSSION

In the present study , decreased sleep quality was found to be very common among medical students as 235(67.42%) students reported poor sleep quality. These findings agree with those of a study conducted on medical students demonstrating that 38.9% of students had poor sleep quality according to the PSQI [18]. A high percentage of respondents i.e > 213 (72%) got less than 7 hrs of sleep per night. .Similar findings were shown wali et al [19] and another studies in Iran[20]

Sleep deprivation is associated with a variety of adverse consequences and can result in significant changes in cognitive functioning, short-term memory and concentration. [21]. Medical students suffer high level of stress due to academic demands. Stress associated with insufficient sleep and excessive daytime sleepiness can result in lower academic performance [22] compromised learning, impaired mood, and increased risk of motor vehicle accidents. It may also lead to difficulties in interpersonal relationship, depression, anxiety, and alcohol and drug abuse.[23,24]

Daytime sleepiness was assessed using the ESS. Our analysis showed that 114 (37%) respondents had ESS score >10 indicating daytime sleepiness of which 91.2% had poor sleep quality and it was very significant which concurs with the findings published previously by Wali et al (19) and BaHammam (15) . People with daytime sleepiness because of insomnia have lower self-esteem and are three times as likely to be involved in road accidents as their well-rested counterparts (*Garbarino et al., 2002*).[25]

In the current study, several factors such as gender, habitat, sleep hours, and daytime sleepiness were associated with sleeping disorder among medical students. Our results were consistent with the findings of Nojomi et al. [26]. These risk factors, aside from socioeconomic status, life habits, and psychological factors, were also demonstrated for sleep disorders in other studies [6,].

The results of the present study revealed that female medical students have a higher prevalence of sleep disorder than males,which is in contrast to the findings of PA Giri et al [8]. Ghanizadeh et al.[27] revealed that the mean duration of night sleep in high school students in Iran is not different between genders. However it is consistent with the study of Keshavarz Akhlaghi and Ghalebandi conducted among pre-university students in Karaj, Iran [20]

It was interesting to note that day scholars had more sleep problems than the hostellites. This has been attributed primarily to the commuting between college and their residences. A feeling of inadequacy in fulfilling family commitments can also be attributed to the higher stress levels in day scholars.

As medical colleges strive to provide the optimal

learning environment to students, more attention needs to be directed towards improvement of students' quality of life. Medical schools should build reforms in medical education and provide recreation centers in order to minimize the stress among students.This can be achieved by establishing counselling facilities that can serve those with physical and psychological difficulties.Medical students, on the other hand, would also have to identify their problems and seek for an advice from the faculty in order to find solutions for it.

The main limitations of the study is that it is based only on subjective assessment by the respondent. False information may be provided by students answering the questionnaires, and students may also be unable to understand or may misinterpret the questions. Moreover, the respondents may not have considered a few nights of sleep difficulty due to stress to be equivalent to insomnia or to a persistent sleep disturbance.

CONCLUSIONS

This study reveals a high prevalence of poor sleep quality among medical students.Therefore, undergraduate medical students should be educated about the importance of adequate sleep to their academic performance. The need for further local research on students' sleep is clear. Research in particular should examine factors that may affect the quality and quantity of students' sleep and its effects on academic achievements and solutions that will help students combat sleep difficulties and avert the deleterious effects of sleep deprivation. .

Conflict of Interest: None

Ethical Clearance: Taken

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Effect of Smoking on Breath Holding Time

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ABSTRACT

Introduction- Breath holding time (BHT) may be considered as one of the indicators of efficiency of breathing function. Tobacco smoking is highly prevalent throughout the world Smoking tobacco causes impairment of lung functions. Hence the present study was done to know the effect of smoking on BHT among healthy males.

Methodology- Study was conducted on 47 apparently healthy male smokers and 47 healthy non smokers between the age group of 20-50yrs. The subject was instructed to hold his breath by pinching the nose with thumb and index finger as long as possible at the end of deep inspiration. The breaking point time was noted in seconds using a stop watch.

Results - The mean breath holding time among smokers was 34.85 seconds, whereas the mean breath holding time was 46.61 seconds among non smokers.

Conclusion - The present study showed that BHT was lower among smokers than non-smokers and the difference was statistically highly significant.

Keywords – *Breath holding time, Smoker, Tobacco.*

INTRODUCTION

There are several pulmonary function tests available to assess the respiratory functions of an individual. Breath holding time (BHT) is one of them and can be applied easily, even in field settings to assess the pulmonary function. BHT is defined as the time taken by the subject to hold his breath as long as he can. Normal voluntary BHT is 45 – 55 seconds. [1]

The point at which breathing can no longer be voluntarily inhibited is called the breaking point. It is due to increased arterial pCO_2 and decreased arterial pO_2. [2]

Breath-holding induces the dyspneic sensation, and BHT gives information about overall efficiency of respiratory system to sustain dyspnea. In normal individuals, breath holding at functional residual capacity, initially there is no sensation for about 15 – 20 sec where oxygen in the residual volume is used to maintain pO_2 level of arterial blood. When all oxygen is used the pO_2 in arterial blood falls gradually inducing dyspneic sensation. Dyspneic sensation increases until the person can no longer hold his breath voluntarily. This point is defined as breaking point of breath holding. The measurement of the period of no respiratory sensation provides us with information about the threshold of dyspneic sensation whereas the measurement of the total breath-holding time is a behavioral measure of the tolerable limit of dyspneic sensation.[3] The breath holding time varies from person to person and with different environmental conditions.[4]

Prevalence of smoking is very high throughout the world and India is no exception. Smoking tobacco causes irritation of the respiratory tract which in turn causes hypertrophy of mucosal cells resulting in increased secretion of mucus and formation of mucosal plugs, which leads to impairment of lung functions.[5]

Literature search revealed that there are very few studies on effect of smoking on BHT. Hence the present

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study was done to know the effect of smoking on BHT among healthy males.

MATERIALS AND METHOD

Study was conducted on 47 apparently healthy male smokers and 47 healthy non smokers between the age group of 20-50yrs. Ethical clearance was obtained by Institutional ethical committee. Informed consent was taken from subjects after explaining the purpose and procedure size of the study.

Inclusion criteria:

Cases – Healthy male subjects with a history of smoking for more than one year and those who smoke five or more than five cigarettes per day.

Controls- healthy male subjects with no past, present or passive history of smoking.

Exclusion criteria:

1. Female subjects to avoid sex bias.

2. Subjects with any illness and those who are exposed to dust or fumes occupationally.

3. Subjects having allergic, endocrine, neuromuscular, musculoskeletal disorders etc. which are likely to affect respiratory function.

Breath holding time was recorded after a period of rest for 10 minutes in morning hours between 11 – 12 pm to avoid any diurnal variation. The subject was instructed to hold his breath by pinching the nose with thumb and index finger as long as possible at the end of deep inspiration. The breaking point time was noted in seconds using a stop watch. The procedure was repeated three times at 5 minutes interval. The highest of the three readings was taken.

Statistical analysis was done by calculating mean breath holding time and standard deviation. Statistical significance was calculated by unpaired t test using SPSS software.

RESULTS

Table-1 shows, the comparison of anthropometric parameters between smokers and non-smokers. The mean ± 2SD age of smokers was 36.77 ± 11.02, while that of non-smokers was 38.61 ± 12.10. The P value was more than 0.05 indicating that the difference in mean age between smokers and non-smokers was statistically not significant.

Similarly the mean ± 2SD for height was 165.04 ±12.16 among smokers and 164.29±10.64 among non-smokers. Again the difference in mean height between smokers and non-smokers was statistically not significant.

The mean ± 2SD for weight was 61.04 ± 16.34 among smokers and 68.31±15.20. The difference was statistically significant. Non-smokers had more weight than smokers.

Table-1: Anthropometric parameters of smokers and non-smokers.

Parameters	Smokers Mean±2SD	Non-smokers Mean±2SD	t- statistic	P value
Age (yrs)	36.77 ±10.02	38.61±12.10	-1.5499	0.1246, >0.05
Height (cms)	165.04±12.16	164.29±10.64	0.6314	0.5294, >0.05
Weight (Kgs)	61.04±16.34	68.31±15.26	-4.4688	0.000, <0.001

Table-2 shows, that the mean breath holding time among smokers was 34.85 seconds, whereas the mean breath holding time was 46.61 seconds among non smokers. Smokers had a shorter BHT when compared to non smokers. When the difference was analyzed using t test, the difference was found to be statistically highly significant ($P<0.001$).

Table-2: Mean ±SD of breath holding time among Smokers and Non- smokers

Group	No.	Breath holding time. Mean ± 1SD	t- statistic	P value
Smokers	47	34.85 ± 11.22	-8.1311	0.000, <0.001
Non – Smokers	47	46.61 ± 16.36		

DISCUSSION

Breath holding test is used as a rough Index of Cardiopulmonary Reserve.[6] BHT is dependent on the volume of oxygen at the beginning of the test i.e., on functional residual capacity and also on diffusing capacity of lungs in a particular individual. Respiratory centers control respiration by sensing pCO_2 and pO_2 levels in the blood. An increase in pCO_2 or decrease in pO2 stimulates respiration.[7] The Breaking point is generally reached when alveolar pO_2 drops to 56mmHg and alveolar pCO_2 rises above 49 mmHg.[1] The time taken to reach breaking point decides the BHT. Maximal BHT is used in Respiratory physiology as a measure of ventilator response. [7,8,9]

The present study showed that BHT was lower among smokers than non-smokers and the difference was statistically highly significant.

Similar to the present study low BHT values were observed in smokers when compared to non-smokers in a study by Sudha et.al in 2012.[10] Similarly lower values of BHT were recorded in smokers exposed to dust and fumes when compared to non-smokers in a study by Mhase VT et.al in 2002.[11] Study by Zvolensky MJ has revealed that breath holding time was longer in sustained smoking quitters. [12]

Tobacco smoking is highly prevalent throughout the world and India is no exception. Smoking causes loss of cilia of respiratory tract, mucus gland hyperplasia, converts pseudostratstified ciliated epithelium to squamous metaplasia, carcinoma, smooth muscle hypertrophy, inflammation, peribronchiolar fibrosis, alteration in alveoli etc.[13] Numerous studies have shown that smokers have about 6 – 20 % lower diffusing capacity when compared to age matched non smokers.[14] The exact mechanisms of smoking affecting BHT is not clear. Smokers show a reduction in all lung functions and their capacity to tolerate physical discomfort is also less compared to non-smokers. It is a known fact that smoking raises the CO2 levels in blood. The CO present in cigarette smoke is more than 600 times the concentration of CO in automobile exhaust. The high levels of CO2 in the blood of smokers bind with hemoglobin and form carboxyhemoglobin. Carboxyhemoglobin affects the oxygen carrying capacity of the blood. Hence, a smoker has high susceptibility for hypoxia and hypercapnia compared to a non-smoker causing the rapid attainment of the break point, and in turn reducing the BHT.[1]

Limitations of the present study were small size of the study population and not considering possible effects of physical activities, duration of smoking, number of cigarettes per day, type of smoking (beedi, cigarette, or any other form), and other confounding factors like psychological factors and motivation. Hence a large scale study considering above points needs to be carried out.

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The Comparative Study of Aerobic Capacity between Physically Trained and Untrained Subjects Using Astrand Ryhming Step Test

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ABSTRACT

Introduction : Research findings in the last three decades have shown that physical inactivity and a negative lifestyle has seriously threatened health and hastened the deterioration rate of the human body. Maximum oxygen uptake (VO_{2max}) is considered the best indicator of aerobic fitness. Hence the present study was done to compare the maximum aerobic capacity between students of medical education leading a sedentary life and students of physical education leading a sedentary life.

Methodology : 50 healthy male medical students and 50 healthy age matched male physical education students of College of Physical education after completion of 9 months of course in the college, were the subjects of the study. VO_{2max} of each subject was recorded by using Astrand-Ryhming step test (ARST).

Results : The comparison of mean±1SD duration of exercise and VO_{2max} between students of ME and PE shows that the scores were more in PE students when compared to ME and all the differences were statistically highly significant.

Conclusion : Physical activities, regular exercise and sports should be encouraged for better cardio respiratory fitness.

Keywords : *VO_{2max}, medical, Physical education, Training, aerobic capacity.*

INTRODUCTION

Research findings in the last three decades have shown that physical inactivity and a negative lifestyle has seriously threatened health and hastened the deterioration rate of the human body. A sedentary lifestyle is the most prevalent modifiable risk factor for cardiovascular diseases, and this is particularly important in view of the mounting evidence that physical activity and regular exercise may reduce the risk for the chronic diseases and death especially from coronary heart disease.[1]

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Maximum oxygen uptake (VO_{2max}) is considered the best indicator of aerobic fitness. Aerobic capacity or VO_{2max} (maximal oxygen consumption) is the maximum capacity of an individuals body to transport and utilize oxygen during incremental exercise, which reflects the physical fitness of the individual.[2]

Those who are fit have higher VO_{2max} values and can exercise more intensely than those who are not as well conditioned. Numerous studies show that you can increase your VO_{2max} by working out at an intensity that raises your heart rate to between 65 – 85% of its maximum for atleast 20 minutes three to five times a week. [3]

The direct determination of VO_{2max} needs well established laboratory set up, skilled personnel, expensive equipments and medical supervision in order to avoid risk factors involved in exhaustive work (maximal test).

Hence in the present study Astrand-Ryhming nomogram was used to calculate VO_{2max} indirectly using heart rate response to sub maximal Astrand-Ryhming step test. Astrand – Ryhming nomogram is suitable for using as an indirect method of estimation of VO_{2max} in Indian subjects. [4]

Due to heavy academic curriculum, medical students do not get time for physical activities and lead a sedentary life. Physical education students undergo regular physical training as a part of their curriculum, Hence the present study was done to compare the maximum aerobic capacity between students of medical education leading a sedentary life and students of physical education leading a sedentary life.

METHODOLOGY

50 healthy male medical students and 50 healthy age matched male physical education students of College of Physical education after completion of 9 months of course in the college, were the subjects of the study. Ethical clearance was obtained from the institutional ethical committee. Test procedure and purpose were explained and a written consent was taken from subjects.

Recording of VO_{2max} by using Astrand-Ryhming step test: [5,6,7,8]

VO_{2max} of each subject was recorded by using Astrand-Ryhming step test (ARST). Each subject completed step 'up' and 'down' task at the rate of 90 steps per minute (22.5 cycles/min) on 40 cm bench (16 inch) for 5 minutes or until exhaustion (when the subject can not maintain the stepping rate for 15 seconds), which ever was early. The subject placed one foot on the platform and later the other, and immediately stepped down, bringing down first the same foot which he placed up first. The rate of stepping at 90 steps per min was maintained with the help of a metronome.

Pulse counts immediately after step test from 15 – 30 seconds were recorded.

Maximum aerobic capacity (VO_{2max}) was indirectly assessed by the **Astrand Ryhming nomogram method (1960)** from submaximal exercise data obtained using ARST. [5,9]

Pulse rate immediately after step test from 15 seconds to 30 seconds was connected with body weight in kg in the Astrand –Ryhming nomogram and VO_{2max} in liters per min was obtained on the middle VO_2 line. VO_{2max} was converted to ml per kg per min by multiplying with 1000 and dividing by body weight. Age correction factor, was not used, as the subjects in the present study were more than 17 years and less than 25 years.

STATISTICAL ANALYSIS

Data was analyzed by following statistical methods.

1. Unpaired 't' test.
2. Chi-square test.

RESULTS

Table-1, shows the comparison of mean±1SD duration of exercise and VO_{2max} between students of ME and PE. All the scores were more in PE students when compared to ME and all the differences were statistically highly significant.

Table-1: Comparison of Duration of exercise and VO_{2max} between students medical and physical education.

Parameter	Medical Education Mean ± SD	Physical Education Mean ± SD	t value	p value	Remark
Duration of exercise(sec)	269.4±43.6	296.1±11.8	4.18	<0.001	HS
VO_{2max} (ml/kg/min)	47.7±6.2	57.5±4.4	9.12	<0.001	HS

HS-Highly significant

Table - 2 shows the comparison of VO_{2max} scores between students of ME and PE. Most of PE students had superior and excellent VO_{2max} scores where as most of ME students had excellent, good and fair VO_{2max} scores. The differences in VO_{2max} scores between both groups were statistically highly significant.

Table-2: Comparison of VO_{2max} scores of medical and physical education students.

Score	Medical Education. Number of students (%)	Physical Education. Number of students (%)	Chi – square Value	p value	Remarks
Superior	12 (24)	41 (82)	36.21	<0.001	HS
Excellent	16 (32)	7 (14)	36.21	<0.001	HS
Good	6 (12)	1 (2)	36.21	<0.001	HS
Fair	15 (30)	1 (2)	36.21	<0.001	HS
Poor	1 (2)	0(0)	36.21	<0.001	HS
Very Poor	0(0)	0(0)	36.21	<0.001	HS

HS-Highly significant

DISCUSSION

Aerobic power is the maximum capacity of an individual's body to transport and utilize oxygen during incremental exercise, which reflects the physical fitness of the individual.[10] Aerobic capacity or maximum oxygen uptake capacity (VO_{2max}) is widely considered to be the best measure of cardio respiratory fitness.[11]

The present study revealed a statistically highly significant higher mean±1SD, VO_{2max} value in PE students(57.5±4.4ml/kg/min) than ME students(47.7±6.24ml/kg/min). The comparison of VO_{2max} scores showed that most of PE students had superior (82%) and excellent (14%) scores while most of ME students has excellent (32%) and fair (30%) scores of VO_{2max}.

The positive relationship between aerobic endurance training and VO_{2max} obtained in the present study is in agreement with a large number of previous studies.

Kavin R et al have reported a significantly high VO_{2max} in trained men(56.7±6.4 ml/kg/min) than VO_{2max} in untrained men(39.8±1.7 ml/kg/min).[12]

In a study on 8 trained and 9 untrained male subjects aged 18-25 yrs from a university by Christie CJA et al, trained subjects showed a significantly higher VO_{2max} (70±7.2 ml/kg/min) than untrained subjects (54.5±3.6 ml/kg/min).[13]

VO_{2max} was compared between high, moderate and low physical activity groups in a study by Shaikh WA et al. Highest VO_{2max} was seen in high physical activity group and least VO_{2max} was seen in low physical activity group.[14]

Two groups of male medical students from Belgium and France respectively had aerobic powers that compared well with those of PE students. It was concluded that this could be because of sampling of the fittest medical students.[15]

Numerous other studies also have shown that trained subjects have higher VO_{2max} than untrained subjects.[16,17,18]

A VO_{2max} of 54.24±6.17 ml/kg/min in national Indian sportsman is reported by Varma SK et al.[19] Prajapati R et al have reported 54.32±0.70 ml/kg/min VO_{2max} in Nepalese medical students.[20] VO_{2max} score of most of medical students was found to be in poor to average range in a study by Tong prasert S et al.[21]

In previously sedentary people, training at 75% of aerobic power, for 30min, 3 times a week over 6 months increases VO_{2max} on an average of 15-20%. [18]

The possible underlying mechanisms for improvement in VO_{2max} by aerobic training are 1.Increase in cardiac output, 2. Increase in arteriovenous O_2 difference because of better utilization of oxygen by exercising muscles and 3.Increase in pulmonary capillary density. [22]

Hence physical activities, regular exercise and sports should be encouraged for better cardio respiratory fitness.

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Comparison of visual reaction time in myopic patients with emmetropic patients

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RESEARCH ARTICLE

Comparison of visual reaction time in myopic subjects with emmetropic subjects

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ABSTRACT

Background: Reaction time is the time between presentation of a stimulus and the appearance of appropriate voluntary response in the subject. The measurement of visual reaction time (VRT) is used to evaluate the processing speed of central nervous system and co-ordination between the visual sense and motor system. Refractive errors were proved to affect the accommodation reaction. Defocusing was known to affect the VRT. However, the influence of the refractive error on VRT was not clearly documented. As blur, defocus, illumination affect lot of psychomotor skills like driving, refractive errors also expected to affect the psychomotor skills. **Aims and Objectives:** This study was undertaken with a purpose to measure and compare the VRT in myopic subjects with and without correcting the refractive error with that of VRT of emmetropic subjects. **Materials and Methods:** The study was carried out among 112 first year medical students in the age group 18 to 20. 60 emmetropic subjects and 52 myopic subjects were involved in the study. The study was carried out with the help of discriminatory and choice reaction time apparatus. VRT was measured in milliseconds. For myopic subjects, VRT was taken before and after correction of their refractive error. Subjects were presented with two visual stimuli, red and green. **Result:** VRT is found to be significantly more in uncorrected myopic subjects as compared to emmetropic subjects for both red and green light stimuli. VRT is found to be significantly less in emmetropic subjects as compared to myopic subjects even after correcting the refracting error. **Conclusion:** The myopic people have greater reaction time than emmetropic people even though when their refractive error is corrected. This adds refractive error as a new member in the row of factors that affects the VRT.

KEY WORDS: Visual Reaction Time; Myopia; Emmetropia

INTRODUCTION

Myopia is one among the most prevalent refractive error of many young people. The "Near Work" hypothesis states that many aspects of our modern environment involve near work, which strains our eyes.[1] For example, reading books and looking at computer and phones which have pixelated screens for a long period. The majority of people in the modern world spend most of their time in doing work termed as "Near Work." Studying for long hours is also a strain to the eye; particularly in student age group. This is especially seen in children whose eyes are still developing. Hence, their eyes may grow permanently elongated and myopic.

As the myopic population is growing day by day, there comes a necessity to find the short comes of myopia. This present study has been conducted to check whether myopia has an impact on binocular simple visual reaction time (VRT).

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Reaction time is the time between presentation of the stimulus and the appearance of appropriate voluntary response in the subject. The measurement of VRT is used to evaluate the processing speed of central nervous system and co-ordination between the visual sense and motor system. Various factors such as age, sex, left or right handedness, central versus peripheral vision, fatigue, fasting, breathing cycles, personality type, exercise, and intelligence were known to influence the reaction time.

Refractive errors were proved to affect the accommodation reaction. Defocusing was known to affect the VRT. However, the influence of the refractive error on VRT was not clearly documented. As blur, defocus, illumination affect lot of psychomotor skills like driving, refractive errors also expected to affect the psychomotor skills.

Reaction time experiments are classified by psychologists into three basic kinds:[2,3] Simple reaction time experiment, recognition reaction time experiment, and choice reaction time experiment. Simple reaction time experiments take a single stimulus and studies single response. The popular phrases used to describe this process are: "X at a known location," "spot the dot," and "reaction to sound" to measure the simple reaction time. Recognition type experiments focus on the responses of recognition called "memory set" and "distractor set." As the response pertains to the memory of the user, there is only one correct response. There are two major types of recognition experiments: "Symbol recognition" and "tone recognition."

In choice reaction time experiments, the corresponding of the response to the stimulus given to the user is tested. A well-known method to test this is to press a key corresponding to the letter that appears on the screen. In such experiments, the stimuli types are given randomly in different sequences. Normally, this kind of experiment is not favored in reaction time experiments because it is always the space bar that the users are instructed to press in response to the stimuli being presented to them.

The mean simple reaction times for college age individuals were taken to be 190 m (0.19 sec) for light stimuli and about 160 ms for sound stimuli.[3-6] Eckner et al., in 2010, measured the average reaction times of NCAA football players were 203 ms when determined with an ordinary falling meter stick; and when the same was measured with the computer, it was 0.268.[7] For a simple visual stimulus, it is mostly the reaction times measured at Clemson, which read closer to 0.268.

Donders, the pioneer of the reaction time, studied all the three kinds of reaction times and demonstrated that a simple reaction is shorter than a recognition reaction time and the longest of the three was the choice reaction time.[8] O'Shea and Bashore did a thorough review of such early studies.[9] Many studies by Laming,[10] Brebner and Welford,[6] and Teichner and Krebs[11] concluded that a complex stimulus, for example, several letters in symbol recognition against one letter, elicits in the user a slower reaction time. Another interesting experiment was carried out by Miller and Low to prove that the processing time decides the differences in reaction time.[12] The relation between VRT and the type of stimuli was observed by Shenvi and Balasubramanian.[13]

Reaction time is also affected by exercise and playing games. The effect of simple eye exercise and pranayama in the improvement of VRT was studied by Gosewade et al.[14] Ghuntla et al. showed that basketball players have significant less VRT than the healthy controls.[15]

MATERIALS AND METHODS

The study was carried out among 112 first year medical students in the age group 18-20. The institutional ethical clearance was obtained before initiating the study. The study population was selected in such a way that the subject were easily accessible, and the study can be done within the stipulated period of 2-month. There were 66 males and 46 females who completed the study. Out of them, 60 were emmetropic subjects and 52 were myopic subjects. Subjects who are smokers and/or alcoholics, who had clinical evidence of any illness, suffering from any psychiatric disorder affecting their psychomotor abilities, were excluded from the study. Informed consent was obtained from all the subjects after they receive verbal explanation of the nature of the study. The study was carried out with the help of discriminatory and choice reaction time apparatus (Anand Agencies, Pune) in the same time of the day for all subjects to avoid influence of circadian rhythm.

With the help of this apparatus, binocular simple reaction time of the subjects was recorded. The participants were taken to the research lab which has optimal lighting condition. Subjects were requested to sit on one side of the apparatus and the examiner the other side. There was almost 80-100 cm distance between the visual stimuli and the subject's eye. The subject was instructed to press the response button immediately when he/she detect the stimulus. The response button terminated the clock counter. This time was taken as VRT in milliseconds. This process was repeated for 5 times, and average value of reaction time was taken as the final reaction time for that sensory modality of that subject. For myopic subjects, VRT was taken before and after correction of their refractive error. Subjects were presented with two visual stimuli, red and green.

The simple VRT of emmetropic subject for red light was noted as emmetropic red reaction time and that of green light was noted as emmetropic green reaction time. And

for myopic subjects, as VRT was collected both before and after correction of the refractive error their data were noted in the following way: Myopic corrected red reaction time, myopic uncorrected red reaction time, myopic corrected green reaction time, and myopic uncorrected green reaction time.

The reaction times were statistically analyzed using Microsoft Excel, Analyse-it, and SPSS software. After checking for the normality of the data by Shapiro-Wilk test, the data were found to be uniformly distributed. So, parametric tests were used to compare the results.

The level of significance between myopic individuals before and after correcting refractive error was analyzed by students' paired *t*-test. $P < 0.05$ was considered significant.

The level of significance between myopic and emmetropic individuals was tested by students' unpaired test. The observation was taken as significant if $P < 0.05$.

RESULT

VRT is found to be significantly ($P < 0.05$) more in uncorrected myopic subjects as compared to emmetropic subjects for both red and green light stimuli (Table 1).

Surprisingly, VRT is found to be significantly less ($P < 0.05$) in emmetropic subjects as compared to myopic subjects even after correcting the refracting error (Table 2).

However, there is no significant difference in VRT when it is compared among the myopics before and after correcting the refractive error. ($P > 0.05$) (Table 3).

DISCUSSION

As simple VRT of myopic subjects is found to be longer than emmetropic subjects, there comes a necessary to find out the reason behind it. Reaction time is affected by various factors such as age, sex, left or right handedness, central versus peripheral vision, fatigue, fasting, breathing cycles, personality type, exercise, and intelligence. Reaction time has two components a sensory and a motor component.

Myopia is a refractive error due to excessive elongation of eyeball or the eye lens is too curved. Because of these factors, the light rays passing through the eye lens converge in front of retina. This creates a blurred image to be perceived by myopic people. However, this error can be corrected using a concave lens of suitable power.

The present study shows that myopic individuals have prolonged reaction time than age- and sex-matched individuals. The myopic people always perceive a blurred image. The increase in blur reduces the perceived brightness. Thus, the blur and the reduced brightness would account for lengthening the sensory component of the RT.

Surprisingly, the myopic subjects with refractive error being corrected using lens also have increased reaction time than emmetropic subjects. This might be due to the fact that the light rays coming from the stimuli suffer refraction through obstacles such as spectacles. When myopic people use spectacles, the visual filed is limited by the frames of the spectacles which may account for increased RT. Therefore, there is a significant difference in VRT between the emmetropic subjects perceiving light rays directly and myopic subjects perceiving light rays passing through

Table 1: Visual reaction time to red and green light stimuli in uncorrected myopic and emmetropic subjects

Stimuli	Emmetropic (ms)		Myopic uncorrected (ms)		*P*
	Average	SD	Average	SD	
Red	192.14	26.21	214.22	28.41	0.00,002 (<0.05)
Green	186.49	25.31	211.77	26.60	0.0,000,007 (<0.05)

Table 2: Visual reaction time to red and green light stimuli in corrected myopic and emmetropic subjects

Stimuli	Emmetropic (ms)		Myopic corrected (ms)		*P*
	Average	SD	Average	SD	
Red	192.14	26.21	206.43	28.78	0.004 (<0.05)
Green	186.49	25.31	204.26	26.82	0.0003 (<0.05)

Table 3: Visual reaction time to red and green light stimuli in corrected and uncorrected myopic subjects

Stimuli	Myopic corrected (ms)		Myopic uncorrected (ms)		*P*
	Average	SD	Average	SD	
Red	206.43	28.78	214.22	28.41	0.08 (>0.05)
Green	204.26	26.82	211.77	26.60	0.08 (>0.05)

different media. Thus, myopic subjects have an increased VRT.

From the study, it is implied that myopia does affect VRT. A very long reaction time indicates impairment of psychomotor skills. Professions like driving heavy machinery, drivers, people who are responsible for taking critical decisions such as intensive care doctors, intensivists, ground clearance in aeronautical engineering, and traffic controllers do need quick reaction time which can be affected by refractive errors.

Driving is often described as visuo-motor task. The "shortest stopping distance" as recommended by the highway code for various speeds of vehicle divides the distance into "thinking and braking distances." VRT is an important component of thinking distance, the pedal response, and mechanical action of the brakes. The perception time of 675 ms is assumed for the optimal conditions. So, VRT can be used as a screening test for employment to ensure safety and as a preventive measure.

CONCLUSION

The present study concludes that myopic people have greater reaction time than emmetropic people even though when their refractive error is corrected. This adds refractive error as a new member in the row of factors that affects the VRT. This study frames a question in our mind whether the myopic people who have undergone laser surgery for correcting refractive error would have normal reaction time or not and thereby extending the study to more subgroups. This study has further scope of expanding the subjects using hypermetropics, myopics with distant VRT comparison using choice reaction time, etc.

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Original Article

Accessory Mental Foramen-An Anatomical Variation of Mental Foramen in Human Mandibles

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ABSTRACT

Introduction: Accessory Mental Foramen (AMF) is an additional Mental Foramen (MF) situated nearby the regular MF and usually placed posterior to the MF. The accessory branch of the mental nerve passes through it. AMF may be one of the factors implicated in regional anaesthesia failure.

Aims: To evaluate the incidence and the anatomical features of the accessory mental foramen, which is occasionally traced additional to the main mental foramen.

Materials and Methods: 61 dry human mandibles of Indian population and of unknown sex were used and analysed for the precise location, incidence and morphological details of accessory mental foramen.

Results: 4 out of 61 (6.55 %) mandibles had Accessory Mental Foramen (AMF). Three specimens had unilateral AMF- 2 on right side, one on left side and one specimen had bilateral AMF. Shape of all AMF was circular with smooth margin.

Conclusion: Presence and location of accessory mental foramen is important during surgical procedures involving mandibular region. The detection of AMFs may reduce the rates of post-operative pain and paraesthesia in surgical procedures.

Key words: Accessory mental foramen, Incidence, Variation, Mandible, Mental foramen.

INTRODUCTION:

Though bilateral single Mental Foramen (MF) is the most common presentation on the anterolateral aspect of the body of mandible and allowing mental nerve to pass, variations like supernumerary or accessory MF or absent foramen are also encountered.[1] Accessory MF (AMF) is an additional MF which is situated nearby the regular MF and usually placed posterior to the MF[2]. It has been suggested that separation of the mental nerve into several fasciculi earlier than the formation of the mental foramen until the 12th gestational week could be a reason for the formation of accessory mental foramen.[1,2,3,4] Toh et al[2] investigated the nerves emerging from the AMF and identified them as the accessory branch of the mental nerve, and confirmed their distribution to the mucous membrane and skin, extending from the corner of the mouth to the labial region. They indicated the possible occurrence of pain caused by injury of the nerves emerging from the AMF by an injection via the mucous membrane. BoronatLópezet al[5] mentioned the AMF as one of the factors implicated in regional anaesthesia failure. Variability in the incidence and location of

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AMF has been reported in the literature. The incidence of AMF has varied between less than 5% and about 30%.[6] Data on shape, size and position of AMF is sparse in literature. Since numerous surgical procedures in oral and maxillofacial surgery as well as several aspects of dental practice involve the mental region, the knowledge of its anatomical variations is essential for the clinician. So, the aim of the present study was to evaluate the incidence and the anatomical features of the accessory mental foramen, which is occasionally traced additional to the main mental foramen.

MATERIALS AND METHODS:

61 dry human mandibles of Indian population and of unknown sex available in the Department of Anatomy, Velammal Medical College Hospital & Research Institute, Madurai, Tamilnadu were used for the study. Measurements were obtained by using a vernier calliper.

Direction of foramen was identified by inserting 25 gauge hypodermic needle and wire into the foramen. For confirmation of accessory mental foramen (AMF) a thick thread was passed through mandibular canal between mental foramen and mandibular foramen and dye was injected into AMF. Staining of the thread labelled the foramen as an AMF.

Mandibles with AMF were named arbitrarily as M-P, M-Q, M-R, and M-S (M for mandible) for easy identification and avoiding confusion (Fig. 1). Number of AMF per 100 mandibles was treated as incidence of AMF. Before measuring, mandibles were kept on a standard horizontal plane to which lower border of the mandible gets its maximum contact when pressure was applied to the molars.

Fig. 1. Mandible (M-P/Q/R/S) showing the Accessory mental foramen (indicated by arrow) on right (R) and left (L) side

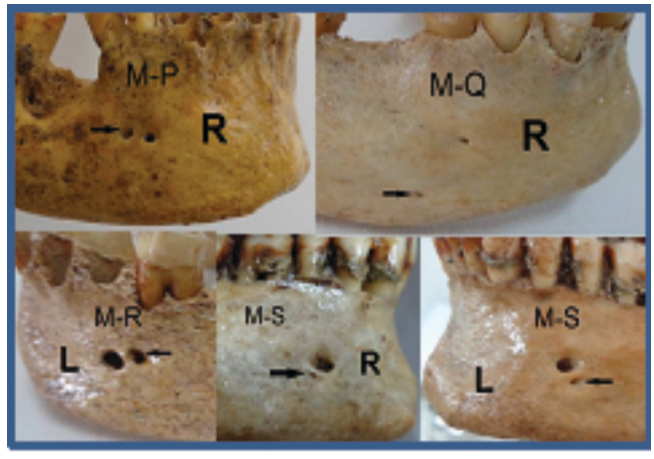
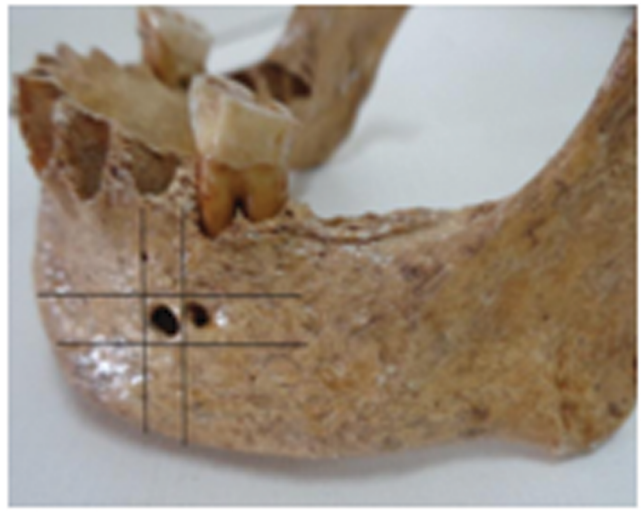


Fig 2. Mandible showing positional relationship between accessory mental foramen (AMF) and mental foramen (MF)- AMF in posterior zone



The frequency of the AMF was calculated. Its dimensions, topographical relationship to the teeth of the mandible, the mental foramen (MF) and the peripheral mandibular landmarks were determined. For that distance from [a] Symphysis menti (Mandibular midline-MML), [b] Inferior border of the mandible, [c] Posterior border of the ramus and [d] Superior border of the body of the mandible (alveolar crest) to the AMF were taken. Size of AMF obtained by using vernier calliper & the shape of AMF was also noted. Position of AMF in relation to teeth of lower jaw was taken.

To locate the AMF in relation to MF, area around MF was divided into eight zones- superior, inferior, anterior, posterior, posterosuperior, posteroinferior anterosuperior, anteroinferior by drawing two pairs of parallel lines vertical pair of lines limiting the anterior and posterior boundaries and horizontal pair of lines limiting the superior and inferior boundaries of the mental foramen (Fig 2).

To assess the extent of separation of accessory mental foramen from mental foramen distance between these two foramina was measured. Mandibles of children and elderly population were discarded. Results were analyzed statistically for central tendency in measures and expressed as percentage, average, median, range and absolute value.

RESULTS:

Incidence, Shape and Size of AMF

In the present study 4 out of 61 (6.55%) mandibles had Accessory Mental Foramen (AMF). Three specimens had unilateral AMF- 2 on right side, one on left side and one specimen (M-S) had bilateral AMF. Incidence of AMF was 4.91% on the right side and 3.27% on the left side. Incidence of bilateral AMF was 1.64% (1 in 61). Shape of AMF was visually recognised and found, all were of circular in shape with smooth margin. The sizes of AMF in all 4 specimens were recorded as 2.0 mm for M-P (right side), 1.1mm for M-Q (right side), 3.0 mm for M-R (left side), 1.3 mm in both sides for M-S. Average size of AMF was 1.74 mm. In 3 specimens AMF were smaller than mental foramen but in one specimen (M-P) both accessory mental foramen and mental foramen were of same size (2 mm). The common characteristic of direction of canal opening in AMF was observed posterosuperiorly in direction.

Location of AMF in relation to various mandibular land marks

I. Location of AMF in relation to mandibular teeth:

AMF was situated on the longitudinal axis of 1st molar in two specimens M-Q having right side AMF and M-R having left side AMF, 2nd premolar in specimen M-P having right side AMF and in specimen M-S having bilateral AMF.

II. Location of AMF in relation to Mental Foramen (MF):

AMF in all 4 specimens- M-P, M-Q, M-R, M-S were observed in posterior, posteroinferior, posterior, and inferior position respectively (Figs. 1&2). In specimen M-S with bilateral AMF both accessory foramina were located in symmetrical position. No AMF was observed in superior, anterior, anterosuperior, anteroinferior and posterosuperior positions. The result of extent of separation between accessory mental foramen and mental foramen was 2mm in specimen M-P, 15mm in M-Q, 1.8mm in M-R and 2mm apart in both sides in specimen M-S. Average distance between AMF and MF was 9.6 mm but median value was 2 mm.

III. Location of AMF in relation to peripheral mandibular landmarks:

Table1.Location of AMF in relation to peripheral mandibular landmarks

Mandibular landmark	Distance between AMF and landmark (Absolute value in mm)				
	M-P (Rt)	M-Q (Rt)	M-R (Lt)	M-S (Rt)	M-S (Lt)
Symphysismenti *(MML)	25	33	29	29	27
Posterior border of ramus	67	68	71	58	61
Base of mandible	17	07	18	10	09
Alveolar crest	13	23	11	14	13
*MML- Mandibular midline; M-P, M-Q, M-R, M-S are Mandible-P/Q/R/S with AMF: Rt-Right, Lt-Left; AMF-Accessory MentalForamen					

DISCUSSION:

Incidence, Shape and Size of AMF :

AMF is a relevant anatomic structure with endemic importance in surgical procedures involving mandibular region. The incidence of AMF varies in the literature. In the present study incidence of accessory mental foramen (AMF) was more on right side than left side. This was in contrast to the result of Singh & Srivastav[7] but in accordance to the result of Devi K Sankaret al.[8], Gupta & Soni[9], and Raman &Choudhary[10] (Table. 2).

Table 2. Side wise comparison of incidence of AMF

Author	Side in percentage	
	Right	Left
Singh and Srivastav[7] (2011)	5.00%	8.00%
Sankar D K et.al[8](2011)	5.55 %	3.33%
Gupta and Soni[9](2012)	4.16%	2.50%
Raman and Choudhary[10] (2015)	11.11%	4.44%
Present study	4.91%	3.27%

Over all incidence of AMF (8.18%) in the present study was less than result of Singh and Srivastav[7] (13%), and Raman and Choudhary[10] (15.55%) but more than the result of Sawyer[11] (4.95%) Virendra Budhirajaet al[12] (6.66%) and Gupta and Soni[9] (6.66%) (Table.3). The occurrence of bilateral AMF is rare. Its Incidence in the current study was 1.63% which was higher than the report of Khojastepour et al[13] (0.64%). Two or more AMF was not found in this study. A very rare occurrence of absence of mental foramen was reported by De Freitas et al.[14]

Table-3. Accessory mental foramen observed by different authors

Author	No. of mandible studied	No. of mandible with AMF (%)
Sawyer[11] (1998)	705	42 (5.9)
Katakami[4] (2008)	150	16 (10.6)
Naitoh[3] (2009)	157	11 (7)
Singh R[7] (2011)	100	13 (13)
Sankar D K[8] (2011)	90	8 (8.9)
Sumit Gupta[9] (2012)	120	8(6.6)
Budhiraja[12] (2013)	105	7 (6.6)
Raman RK[10] (2015)	45	7(15.5)
Present study	61	4 (6.5)

Shape of AMF may be oval or circular as reported in different studies[7,15]. In the present study all AMFs were circular in shape which is similar to the report of Singh and Srivastavas they also observed circular AMF only.[7]

Average size of AMF on the left side (2.1 mm; range: 1.3-3.0mm) was more as compared to the right side (1.47mm; range: 1.1-2.0mm). Side wise similar trend was observed by Singh and Srivastav[7] but size of AMF in their report was less (right side: 0.78mm and left side: 1.00mm) in comparison to our findings. AMF is usually smaller than regular MF[4,9,15] but in one specimen (M-P) in our finding both accessory mental foramen and mental foramen were of same size (2 mm). The direction of canal opening in AMF was observed posterosuperiorly which is in accordance to the study report of Katakami et al.[4]

Location of AMF in relation to various landmarks

Anatomical variations in the mandible can cause surgical complications if not properly identified but very limited data are available in Indian population regarding location of AMF.

I.Location of AMF in relation to mandibular teeth: In the present study a total of 5 AMF (3 AMF on right side and 2 AMF on left side) were present on 61 mandibles including one mandible with bilateral AMF. On the right side, 2 out of 3 AMF were situated on the body of mandible on the longitudinal axis of 2nd premolar and one on 1st molar but in the report of Singh and Srivastav[7] all 5 AMF out of 13 observed AMF were between 1st and 2nd premolar. On the left side, out of 2 one AMF was present on the body of mandible on the longitudinal axis of 1st molar and another one on 2nd premolar but in the report of Singh and Srivastav[7] all 8 AMF out of 13 observed AMF were below the apex of 1st premolar tooth.

II.Location of AMF in relation to mental foramen (MF): Posterior and inferior location of AMF were observed as common location in this study but in the study results of Katakami et al.,[4] conducted on 150 mandibles found 17 AMF including one triple foramen where common location of AMF was posterior (59%) followed by inferior (47%). Average distance between AMF and MF was 9.6mm in the current study which is too high as compared to the report of Singh and Srivastav[7] 0.67mm (range: 0.6-1.5mm) and the report of Toh et al.[2] where they found the distance AMF and MF in three cadavers as 0.67mm, 2.1mm and 4.57 mm. In our finding higher average value (9.6 mm) is due to wide range (1.8-15 mm) of distances between AMF and MF and the wide range is due to observation of very widely separated (15 mm) AMF from regular MF in one mandible. The range for other 3 mandibles (1.8- 2 mm) is within the range of Toh etal.[2] (0.67-4.57 mm) but outside the range of Singh and Srivastav[7] (0.6-1.5 mm). But median distance between AMF and MF (2 mm) in our results matched with the result of Katakami et al.[4] as they also observed same median value (2 mm) for the distance between AMF and MF. According to Katakami et al.[4] position of AMF is influenced by the site of branching and length of accessory mental nerve.

III.Location of AMF in relation to peripheral mandibular landmarks: Average distances of AMF from symphysismenti (mandibular midline), posterior border of ramus, base of mandible, alveolar crest were 28.6 mm, 65 mm, 12.2 mm, 14.8 mm respectively (Table-1). These measurements provide the alternative way to locate AMF on the mandibular body and helpful for precise location of AMF in edentulous persons and persons with anomalous teeth. No data are available in literature for comparison.

CONCLUSION:

In the present study 4 out of 61 (6.55%) mandibles had Accessory mental foramen (AMF) and one out of 61 (1.63%) had bilateral AMF. Therefore identification and location of accessory mental foramen is important during surgical procedures and dental implant insertion involving the mandibular, premolar and molar region. The possible presence of AMF should not be overlooked to avoid the occurrence of a neurosensory disturbance during surgery and implant insertion.

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Morphometric analysis of superior articular facets of atlas vertebra and its clinical applications

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Abstract:

BACKGROUND

The anatomy of the atlas vertebra reveals complex, three-dimensional structures, showing extensive variability in morphology. The large number of variations seen in the shape, size and depth of the superior articular facets of the atlas vertebrae indicate that the atlanto-occipital joint is correspondingly variable. Features of the atlas vertebra must be familiar before any spinal surgeries.

The objectives of the present study were to report the analysed morphological features and metrical values of superior articular facets of atlas vertebra.

MATERIALS AND METHODS

The study was carried out on 32 (64 sides) dried specimens of atlas vertebrae for variability in shape due to presence of constriction and partial or complete separation of superior articular facets. Superior articular facets of the vertebrae were measured for dimension, using Vernier calliper and any abnormalities present in it were noted down and photographed. Intact human atlases from the dissected cadavers were utilised but broken, undeveloped, porous macerated bones (atlas vertebrae) were also excluded from the study. Statistical analyses of the measurements were done.

RESULTS

Oval, kidney, dumb bell, figure of eight and trilobed shapes were observed either on both sides or on one side. Commonest shape of superior articular facet was oval in 40.62% of specimens.

On right side, the average length was 20.3 mm & breadth was 11.7 mm. On left side, the average length was 21 mm & breadth was 11.05 mm. Complete separation of facets was seen in 3.12% of vertebrae.

CONCLUSION

The knowledge of these measurements and the variations present may be of importance to understand the ergonomics of the craniovertebral joint and they are helpful for orthopaedic surgeons, neurosurgeons, clinicians and radiologists in day-to-day clinical practice.

KEYWORDS

Superior Articular Facet, Atlas, Vertebra.

Full Text:

BACKGROUND

The first cervical vertebra, namely the atlas (C1) is a ringshaped unique vertebra and has different anatomical features from other cervical vertebrae. It (C1) holds the globe of the skull and is devoid of body and spine. It has two lateral masses linked by an anterior and posterior arch. The posterior arch of the atlas forms about 3/5th of the atlantal ring. [1,2]

Superior Articular Facets (SAF) are present on atlas vertebra facing superomedially and they occupy most of the upper surface of the lateral mass and lie obliquely, their anterior ends being always nearer to the midline than the posterior ends. Facets are usually concave, with concavity in both longitudinal and transverse directions. The facets form an atlanto-occipital joint with occipital condyles and this joint is responsible for nodding movements and also for the weightbearing of the head. The atlanto-occipital joint strains predominantly induce a tension-like headache which is caused as a result of a prolonged and an inappropriate posture which results from a poor ergonomic adaptation. Cervical spine malformations and craniovertebral junction abnormalities which lead to hypermobility of atlantooccipital joints, give rise to neurological and vascular symptoms. [1,3,4] It has been postulated that anteroposterior axial changes are important for assessing the surgical applications.

The anatomy of the atlas vertebra reveals complex, three-dimensional structures, showing extensive variability in morphology. Features of the atlas vertebra must be familiar before any spinal surgeries. So the objectives of the present study were to report the analysed morphological features and metrical values of superior articular facets of atlas vertebra.

MATERIALS AND METHODS

This study was carried out on 32 (64 sides] dried specimens of human atlas (CI] vertebrae of unknown age and sex from the Department of Anatomy, Velammal Medical College, Madurai, Tamil Nadu. The superior articular facets were studied for variability in shape due to presence of constriction and partial or complete separation of facets. Superior articular facet of the study vertebra was measured, using Vernier calliper and any abnormalities present in it were noted down and photographed. All the measurements were recorded bilaterally, in millimetres. All study specimens (vertebrae] were inspected to ensure that they were intact and free from osteophytes or metastatic tumours before measurements were made.

Inclusion Criteria

Intact human atlases from the dissected cadavers. Exclusion Criteria

1. Broken, undeveloped and porous atlas vertebrae were excluded from the study.

2. Macerated bones were also excluded from the study.

Each atlas vertebra was inspected for the constrictions on the margins of the facets whether it was on medial margin, lateral margin or on both margins along with study of symmetry. Grooves of facets were inspected for its shallow or deepness; divisions of facets were dependent on morphology of grooves.

Divisions and shapes were studied according to presence of constrictions and grooves, when constrictions were on one margin either medial or lateral, it was considered as kidney shaped.

When facets were notched at multiple sides, it was considered as irregular shape.

When constrictions were present on one margin and grooves were absent, that was considered as Non-division. Kidney, Oval and irregular shapes were defined in non-division type of superior articular facet. When constrictions were present on both margins along with deep groove, it was considered as complete division and presence of symmetry was also studied.

Shape	Side of SAF			Total sides	
	Bilateral	Right Side	Left Side	Number	%
Oval	9	4	4	26	40.62
Kidney	4	4	5	17	26.56
Dumb bell	-	3	4	7	10.94
Figure of eight	-	3	2	5	7.81
Trilobed	-	2	1	3	4.69
Complete separation	-	1	1	2	3.12
Irregular	2	-	-	4	6.24

Table 1. Sidewise Distribution of Various Shapes of Superior Articular Facet (SAF) (N=64)

When constrictions were present on both margins and grooves were shallow, it was considered as incomplete division which was forming two shapes, figure of 8 shaped and dumb-bell shaped. When constrictions were present on both margins of facets, far apart from each other and specially a groove was present connecting these constrictions, considered as 8 shaped. When constrictions were present on both margins approaching the centre of facets, the shape of SAF was considered dumb-bell shaped. [3]

Depth of facets was also studied, when it was shallow it was considered as flat and when it was deep it was considered as concave. The facets which were notched at multiple sides were considered as irregular in shape.

Maximum Antero-posterior Diameter (length] of superior articular facet: Two points were taken, one on the anterior limit of SAF and other on its posterior limit, then length was measured (in mm] along its principal axis directed anteromedially.

Maximum Transverse Diameter (width] of superior articular facet: Two points were taken, one on the medial limit of SAF and other on its lateral limit, then width was measured (in mm] perpendicular to the principal axis.

Statistical analyses of the measurements were done.

RESULTS

Shape of Superior Articular Facet

Of the 64 superior articular facets which were examined, 26 facets (40.62%] were without constrictions i.e. oval shaped (Figure 1]. 17 facets (26.56%] showed a constriction only on one

side and were considered as kidney shaped (Figure 2]. 5 facets (7.81%)] showed a constriction on both the sides and far apart along with a groove in the centre of the facet, which were considered as the 'figure of 8' shape (Figure 3]. 7 facets (10.94%] were found to have a constriction on both the sides with constriction approaching towards the centre of the facet and were labelled as dumb-bell shaped (Figure 4].

Trilobed facet was seen in 3 facets (4.69%>], 2 on right side and 1 on left side of three atlas vertebrae (Figure 2].

When there were constrictions on both the margins and grooves were deep, division was complete. In our study, 2 facets (3.12%] of two different vertebrae, one on right side and other on left side showed complete separation of facet into two parts with a gap in between (Figure 4] upper facets were quadrangular and lower facets were triangular.

Two atlas vertebrae with irregular superior articular facet showed ridge in the centre (6.24%] (Figure 5]. The sidewise distribution of shapes of superior articular facet is shown in Table 1. Depending on depth, SAF were either concave or flat. Concave facets were more, 65% on both the sides. Flat facets were observed in 35% on both the sides.

Shape of SAF	Manjunath & Ranganath[5] N = 100	Lalit et al[6] N = 60	Ashita et al[7] N = 100	Kintu et al[8] N = 200	Girish & Shishir[9] N = 200	Present Study N = 64
Oval	33 (33%)	17 (28.33%)	31 (31%)	76 (38%)	53 (26.5%)	26 (40.62%)
Kidney	10 (10%)	12 (20%)	18 (18%)	45 (22.5%)	19 (9.5%)	17 (26.56%)
Dumb bell	-	21 (35%)	24 (24%)	51 (25.5%)	85 (42.5%)	7 (10.94%)
Figure of eight	18 (18%)	10 (16.67%)	13 (13%)	-	20 (10%)	5 (7.81%)
Trilobed	-	-	-	-	-	3 (4.69%)
Complete separation	-	-	9 (9%)	-	-	2 (3.12%)
Triangular	-	-	-	-	23 (11.5%)	-
Elongated	-	-	-	28 (14%)	-	-
Irregular	39 (39%)	-	-	-	-	4 (6.24%)

Table 2. Showing the Frequency (in percentage) of Shapes of Superior Articular Facet (SAF) and its Comparison with other Authors; N = Number of Facets

Size of Superior Articular Facet

Observed and measured values of superior articular facet (SAF] were as below:

On right side, average length was 20.3 [+ or -] 3.12 mm and breadth was 11.7 [+ or -] 1.15 mm.

Shape of Superior Articular Facet	Authors with Superior Articular Facet (SAF); N-Total Number Facet					
	Side of SAF	Lalit et al[6] 2011 N = 60	Ashita et al[7] 2016 N = 100	Kintu et al[8] 2013 N = 200	Girish[9] 2014 N = 200	Present study N = 64
Oval	Right	10	17	37	29	13
	Left	7	14	39	24	13
Kidney	Right	6	8	26	7	7
	Left	6	10	19	12	10
Dumb Bell	Right	11	13	23	44	3
	Left	10	11	28	41	4
Figure of Eight (8)	Right	3	6	-	10	3
	Left	7	7	-	10	2
Trilobed	Right	-	-	-	-	2
	Left			-		1
Complete Separation	Right	-	5	-	-	1
	Left		4			1
Irregular	Right	-	-	-	-	2
	Left	-	-	-	-	2
Triangular	Right	-	-	-	10	-
	Left	-	-	-	13	-
Elongated	Right	-	-	14	-	-
	Left	-	-	14	-	-

Table 3. Comparison of Superior Articular Facet with other Authors in relation to Shape and Side

On left side, the average length was 21 [+ or -] 2.16 mm and breadth was 11.05 [+ or -] 1.11 mm.

Average size of superior articular facet showing complete separation was 11.3 mm x 9.1 mm and 10.2 mm x 8.6 mm with a gap of 5.1 mm.

DISCUSSION

Injuries of the upper cervical spine which cause severe disabilities following trauma have always been an interesting focus for anatomists. [4] Superior articular facets which are present on the atlas vertebrae face superomedially and are well known for nodding movements and furthermore for the weightbearing of the head. These are also known for the reception of the condyles of the occipital bone to form an atlanto-occipital joint. The wide variation in the morphometric parameters of superior articular facets like the asymmetry, constrictions along the margins, shapes, sizes and separations of facets were reported in the literature. The large number of variations seen in the shape, size and depth of the superior articular facets of the atlas vertebrae indicate that the atlanto-occipital joint is correspondingly variable.

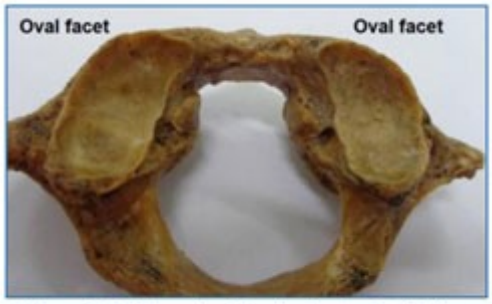

Figure 1. Oval Superior Articular Facet on both Sides

Shape of Superior Articular Facet

In our study, the oval shape (40.62%) of the superior articular facet (SAF) was the most commonly observed shape, which was succeeded by kidney (26.56%), dumb bell shape (10.94%) and figure of 8 shape (Table 1 & 2; Figure 1-5). Similar to our study, Kintu et al [8] (38%) and Ashita et al [7] (31%) also reported oval shape of the superior articular facet (SAF) as the most commonly observed shape, but in their report oval shape of SAF was succeeded by dumb bell shape and kidney shape. Girish [9] (42.5%) and Lalit et al [6] (35%) reported dumb bell as the most commonly observed shape (Table 2). In contrast to the present study where we observed irregular shape only in 6.24% of SAF, Manjunath & Ranganath [5] observed irregular facet (39%) as the most common shape of SAF which was followed by oval shape (33%). Completely separated bilobed SAFs were observed in 3.12% of our study SAFs which is lesser than the findings of S Singh [3] (5.5%) and Ashita et al [6] (9%). An uncommon shape of SAF i.e tri-lobed SAF was observed in 4.69% of the current study SAFs. Gupta et al [10] has also mentioned the trilobed SAF in 4.3% of their study specimen.

While considering the sidewise distribution of SAF in the present study, oval-shaped facets were equally distributed in both sides each having 13 facets but in other comparative studies, oval shape was more common on the right side. Kintu et. Al [8] reported oval shaped SAFs were more common on the left side. Kidney-shaped SAFs were more on the left side in our findings which matches with the findings of Ashita et al [7] and Girish & Shishir, [9] but this shape was more common on the right side as per report of Kintu et al. [8] According to the study report of Lalit et al, [6] kidney-shaped SAFs were equally distributed in both sides each having 6 SAFs (Table 3). SAFs with dumb bell shape were more common in the left side in the present study which matches the report of Kintu et al [8] but as per study reports of Lalit et al, [6] Ashita et al [7] and Girish & Shishir, [9] right side dominates over left side.

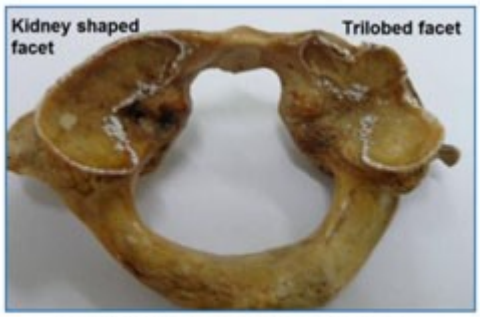

Figure 2. Kidney Shaped & Trilobed Facet

The superior articular facet of the atlas with a different shape i.e. an oval kidney, dumb bell shape, is also an indication of the further restriction of the movements at the atlanto-occipital joint. [6]

Size of Superior Articular Facet

In the present study, average size of superior articular facet (SAF) was approx. the same on both sides. The anteroposterior diameter (length) of superior articular facet of atlas was found to be 20.3 mm on the right side and 21 mm on the left side. The transverse diameter (breadth) of superior articular facet of atlas was found to be 11.7 mm on the right side and 11 mm on the left side. As compared to our finding- right side (length: breadth = 20.3 mm: 11.7 mm) and left side (length: breadth = 21 mm: 11 mm), slightly higher average size with similar tendency was reported by Gupta et al [10] on both sides-right side (length: breadth = 21.5 mm: 11.8 mm) and left side (length: breadth = 21.8 mm: 11.5 mm). Ashita et al [7] also reported their findings higher than ours-right side (length: breadth = 21.33 mm: 11.53 mm) and left side (length: breadth =21. 37 mm: 11.72 mm).

In completely separated bilobed SAF, two lobes were separated by 5.1 mm which matches with the finding of S SinghPl where he mentioned, in some cases of the completely separated facets are 5 mm apart. Asymmetry of SAF was the common finding in the present study. G Paraskevas et al [11] reported an increase in the incidence of separation of SAF and that a decrease in constrictions could possibly be the result of a restriction in the atlanto-occipital motion in old age.

CONCLUSION

The study of SAFs of human atlas vertebrae showed different shapes. The most commonly observed shape was oval shape, followed by kidney shape, dumb bell and figure of eight shape. Completely separated bilobed SAFs were observed in 3.12% of our study SAFs. No vertebra showed symmetrical facets. The knowledge of these measurements and the variations present may be of importance to understand the ergonomics of the craniovertebral joint, useful for anatomists in enhancing their teaching skills and helpful for orthopaedic surgeons, neurosurgeons, clinicians and radiologists in dayto-day clinical practice.

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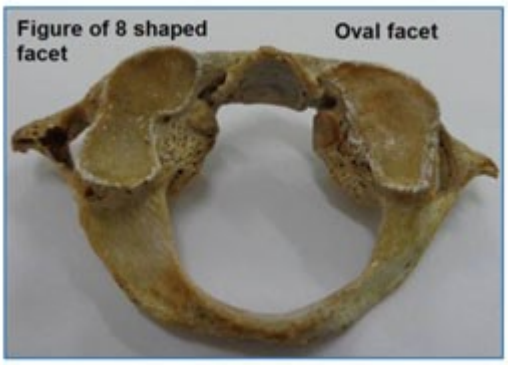

Figure 3. Figure of 8 Shape & Oval Shape of Superior Articular Facet

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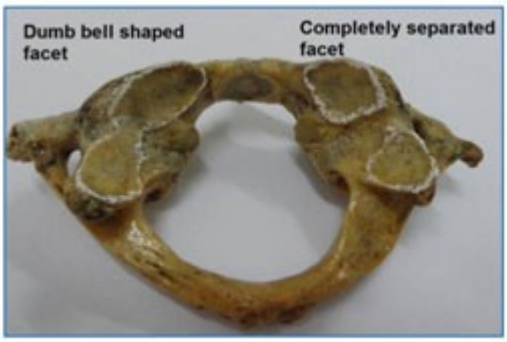

Figure 4. Dumb bell shaped Facet on Left Side and Completely Separated Facet on Right Side

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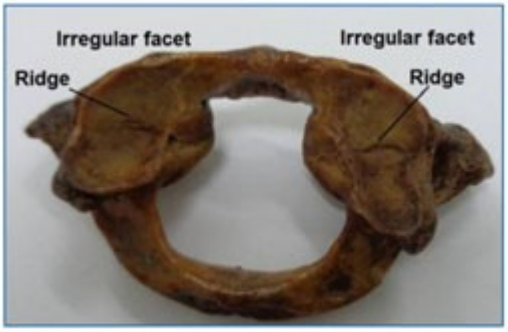

Figure 5. Irregular Facet with Ridge on both sides

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Caption: Figure 1. Oval Superior Articular Facet on both Sides

Caption: Figure 2. Kidney Shaped & Trilobed Facet

Caption: Figure 3. Figure of 8 Shape & Oval Shape of Superior Articular Facet

Caption: Figure 4. Dumb bell shaped Facet on Left Side and Completely Separated Facet on Right Side

Caption: Figure 5. Irregular Facet with Ridge on both sides

Table 1. Sidewise Distribution of Various Shapes of Superior Articular Facet (SAF) (N=64)

Shape	Side of SAF			Total sides	
	Bilateral	Right Side	Left Side	Number	%
Oval	9	4	4	26	40.62
Kidney	4	4	5	17	26.56
Dumb bell	--	3	4	7	10.94
Figure of eight	--	3	2	5	7.81
Trilobed	--	2	1	3	4.69
Complete separation	--	1	1	2	3.12
Irregular	2	--	--	4	6.24

Table 2. Showing the Frequency (in percentage) of Shapes of Superior Articular Facet (SAF) and its Comparison with other Authors; N = Number of Facets

Shape of SAF	Manjunath & Ranganath [5] N = 100	Lalit et al [6] N = 60	Ashita et al [7] N = 100
Oval	33 (33%)	17 (28.33%)	31 (31%)
Kidney	10 (10%)	12 (20%)	18 (18%)
Dumb bell	--	21 (35%)	24 (24%)
Figure of eight	18 (18%)	10 (16.67%)	13 (13%)
Trilobed	--	--	--
Complete separation	--	--	9 (9%)
Triangular	--	--	--
Elongated	--	--	--
Irregular	39 (39%)	--	--

Shape of SAF	Kintu et al [8] N = 200	Girish & Shishir [9] N = 200	Present Study N = 64
Oval	76 (38%)	53 (26.5%)	26 (40.62%)
Kidney	45 (22.5%)	19 (9.5%)	17 (26.56%)
Dumb bell	51 (25.5%)	85 (42.5%)	7 (10.94%)
Figure of eight	--	20 (10%)	5 (7.81%)
Trilobed	--	--	3 (4.69%)
Complete separation	--	--	2 (3.12%)
Triangular	--	23 (11.5%)	--
Elongated	28 (14%)	--	--
Irregular	--	--	4 (6.24%)

Table 3. Comparison of Superior Articular Facet with other Authors in relation to Shape and Side

Shape of Superior Articular Facet	Authors with Superior Articular Facet (SAF); N-Total Number Facet		
	Side of SAF	Lalit et al [6] 2011 N = 60	Ashita et al [7] 2016 N = 100
Oval	Right	10	17
	Left	7	14
Kidney	Right	6	8
	Left	6	10
Dumb Bell	Right	11	13
	Left	10	11
Figure of Eight (8)	Right	3	6
	Left	7	7
Trilobed	Right	--	--
	Left		

Complete Separation	Right	--	5
	Left		4
Irregular	Right	--	--
	Left	--	--
Triangular	Right	--	--
	Left	--	--
Elongated	Right	--	--
	Left	--	--

Shape of Superior Articular Facet	Authors with Superior Articular Facet (SAF); N-Total Number Facet		
	Side of SAF	Kintu et al [8] 2013 N = 200	Girish [9] 2014 N = 200	Present study N = 64
Oval	Right	37	29	13
	Left	39	24	13
Kidney	Right	26	7	7
	Left	19	12	10
Dumb Bell	Right	23	44	3
	Left	28	41	4
Figure of Eight (8)	Right	--	10	3
	Left	--	10	2
Trilobed	Right	--	--	2
	Left	--		1
Complete Separation	Right	--	--	1
	Left			1
Irregular	Right	--	--	2
	Left	--	--	2
Triangular	Right	--	10	--
	Left	--	13	--
Elongated	Right	14	--	--
	Left	14	--	--

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Original Article

Prescribing pattern of antimicrobial agents in in-patients of a tertiary care center A study on the goals of antimicrobial therapy

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ABSTRACT

Introduction: The development of antimicrobial resistance and also down in the process of development of newer drugs are the major challenges to the health sectors in the new millennium. Hence the knowledge of the disease pattern and the rational use of drugs play a significant role in overcoming the above challenges.

Aim: The present study was focused to know the pattern of utilization of the different group of antimicrobials along with the goal for antimicrobial therapy.

Materials and methods: The present study was done in 260 patients who were admitted as in-patients in the medicine and surgery departments of Velammal Medical College Hospital, Madurai.

Results: The goal of antimicrobial therapy in the medicine in-patient department was empirical (81%) and in surgery was prophylactic (78%). The most commonly administered group of antimicrobials was the cephalosporins (42.1%).

Conclusion: The health care professionals may give importance for more rational and judicial use of antimicrobial drugs show that the emergence of antimicrobial resistance can be reduced.

Key words: Antimicrobial agents, Antimicrobial resistance, Utilization pattern, Irrational, Cephalosporins.

INTRODUCTION:

Health care personnel need to have an approach which is constructive to successfully overcome the problems due to the availability of various groups of antimicrobial agents (AMAs). This task also requires the knowledge about the pattern of antimicrobial agents being used to treat the bacterial infections. Otherwise an irrational prescription causes additional economic burden and also leads to serious morbidity and the mortality.[1,2] It is recommended to the hospitals to bring down the incidence of emergence of antimicrobial resistant strains by monitoring the antibacterial use and the susceptibility trends. When an individual develops resistance, it becomes a significant threat to the community health apart from increasing the chances of an unsuccessful outcome of the treatment.[3,4]

Goals of chemotherapy can be broadly divided into prophylactic, empirical and definitive therapy. Prophylaxis is given either to slow down the progress of an infection or prevents it in some individuals. Definitive therapy is for a known pathogen, but more often the bacterial infections are challenged initially by empirical therapy guided by the clinical picture of the disease. This is because it takes 1-3 days to obtain the culture and sensitivity reports.[5,6]

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MATERIALS AND METHODS:

This study was undertaken at the medicine and surgery inpatient departments of Velammal Medical College Hospital, Madurai for 3 months from February 2016 to April 2016. All the patients admitted to the above said departments were included for the study. The exclusion criteria's were those who got discharged against medical advice, age below 16yrs and hospital stay of less than 2 days. Total of 260 patients were enrolled for the study based upon the inclusion and the exclusion criteria's. The institutional ethical committee had approved the study and the informed consent was obtained from all the patients. Information regarding the goals of antimicrobial agents being used in a particular patient had been collected from the case file.

RESULTS:

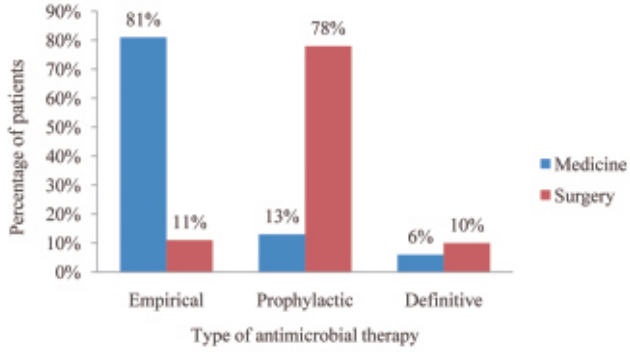
The observations from the individual patients were pooled and analyzed in the Microsoft excel sheet. Out of the 260 patients enrolled for the study, 159 were males and 101 were females. The male: female ratio was 1.57:1. The numbers of patients from the medical department were 126 (48.5%) and the surgical department was 134 (51.5%). Among the total patients, 185 (71%) received antibiotics while the remaining 75 (29%) were not administered any antibiotic. In the total 185 individuals who received antimicrobials, 70 (56%) were from the medicine department and 115 (85%) were from the surgery department (Table 1).

Table 1. Comparison of various parameters

Parameter	Medicine	Surgery
Number of patients enrolled (n=260)	126 (48.5%)	134 (51.5%)
Number of patients who received antimicrobials	70 (56%) n=126	115 (85%) n=134
Number of patients who received single AMA	33 (47%) n=70	30 (26%) n=115
Number of patients who received > 1 AMA	37 (53%)	85 (74%)

The goal of therapy for the administration of antimicrobial agents to the inpatients in the descending order of priority wasmedicine (n=70): empirical 57 cases (81.4%), prophylactic 9 cases (12.9%), and definitive 4 cases (5.7%). In surgery (n=115) prophylactic 90 cases (78.3%), empirical 13 cases (11.3%) and definitive 12(10.4%)(Fig1).

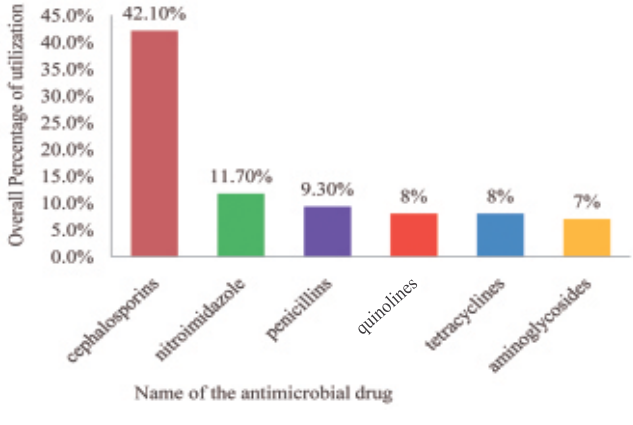
Figure 1. Objective of antimicrobial use



In medicine (n=70), 47% (33) of the patients were treated with single antimicrobial drug and 53% (37) were treated with 2 or more AMAs. In surgery (n=115), 30(26%) were given single drug whereas 85 (74%) received poly AMAs.

The overall utilization pattern of antimicrobials to the inpatients were cephalosporins (42.1%), metronidazole (11.7%), penicillins (9.7%), quinolones (8%), tetracyclines (8%) and aminoglycosides (7%) (Fig2).

Figure 2. Utilization of different group of antimicrobial agents.



Individual drug wise pattern of usage in the departments were as follows. Medicine; ceftriaxone (30%), doxycycline (20%), cefotaxime (15%), amoxicillin (15%), metronidazole (10%)(Fig 3) and surgery; cefoperazone (40%), metronidazole (30%), amoxicillin (28%), cefotaxime (22%), cefixime (19%) and ceftriaxone (18%) (Fig4).

Figure 3. Frequency of antimicrobial prescribing in medicine department.

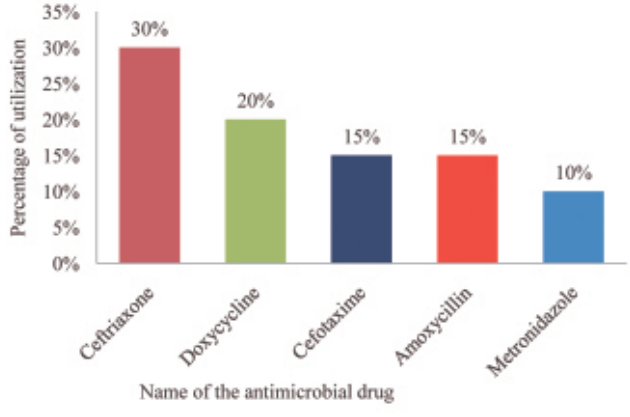
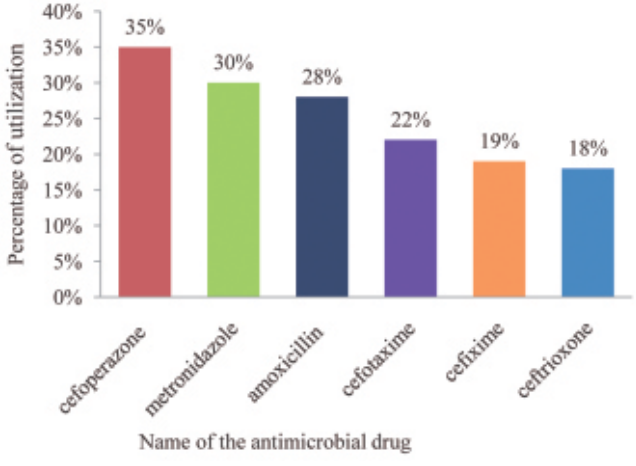


Figure 4. Frequency of antimicrobial prescribing in surgery department.



DISCUSSION:

The male gender dominant ratio observed in this study (1.57:1) was almost similar to a study done by AazedJaved Khan et al. The reason for this may be that the men being the dominant partner and the bread winner of our family set up, usually gets more medical care than women unless or otherwise the disease in the female is serious enough to cause a morbidity.[7] Antimicrobial agents remain to be one of the frequently prescribed drug among the general population.[8] It was observed (table.1) that more percentage of patients from the surgical wards received antimicrobials (85%) than the medical ward (56%). This result was found to be contrary to the study results by Asuman et al and Alexia Cusini et al. The possible explanation may be that the surgical departments encounter more admissions which require surgical interventions.[9,10]

It was found (Fig1) that in the medicine department, the AMA's were predominantly administered as an empirical therapy and at the same time it is as a prophylaxis in the surgery. But the most important factor for our concern is that very few patients (less than 10%) in both departments had been referred for the microbiological test (culture and sensitivity) and received drugs based on the report. Culture and sensitivity results of few patients had been neglected while selecting the AMA's. This was also confirmed by earlier studies.[11] The ratio of single antimicrobialversus2 or more AMAs was almost equal in medicine in-patients where as in surgery only 1/3 rd of the patients received single AMA and the remaining received > 1.Similar result was seen in a study by Younis Bilal Bin et al.[12]

Cephalosporins (3rd generation) remain the most commonly prescribed AMA in this study (figure.2) which had been emphasized by many earlier studies like AsawariRaut et al and Maheswari et al.[13] The results of the Figure 3 & 4 show that ceftriaxone was the most commonly used

antimicrobial in the medicine ward where as in the surgery ward it was the cefoperazone. Surgeons had generally preferred the combination of a beta lactamase inhibitor (sulbactum) with cefaperazone.[14,15] In the medicine department, amoxicillin was usually given as a fixed dose combination with a beta lactamase inhibitor (clavulanic acid).

CONCLUSION:

The emergence of new resistant micro organisms along with unfortunate slowdown in the development of new AMA's during the last two decades have been a great concern to the medical profession. Pending the identification of new targets and compounds, the physicians will have to depend on the currently available group of drugs. In this background, it becomes the need of the hour for more judicious, rational use of existing AMAs in addition to promoting definitive antimicrobial therapy to known pathogens.

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Original Article

Analysis of Pharmacology Undergraduate Examination Patterns of Medical Universities of South India

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ABSTRACT

Introduction: Comprehensive theoretical and practical assessment of pharmacology of 2nd MBBS students during university examinations should ideally be done across the three domains of learning (cognitive, affective, and psychomotor), should be sufficiently interactive, and should cover major subspecialties of pharmacology.

Aims and objectives: To analyse the undergraduate pharmacology examination pattern (theory and practical) of South Indian Universities regarding composition of different domains, extent of examiner-student interaction, and inclusion of questions from different pharmacology subspecialties

Materials and methods: Questions asked in theory and practical examination in nine different Universities from Tamil Nadu, Pondicherry, Karnataka, Kerala, and Andhra Pradesh were categorised into (a) domain of learning, (b) interaction present/ absent, and (c) subspecialty, and analysed descriptively.

Results: Cognitive domain dominates over affective and psychomotor domains in both overall examination marks (81.69 %, 9.85 %, and 8.46 % respectively for the three domains) and in practical examination marks (87.64 %, 0.78 %, and 11.58 % respectively for the three domains). After excluding viva examination, on an average 56.88% marks awarded without interaction in practical examination. Questions from clinical pharmacology contributed 59.44 % marks during practical examinations, followed by experimental pharmacology (19.38 %), and spotters (10.91%). Only two of the nine Universities had incorporated OSPE (objective structured practical examination) exercises in their final practical examination schemes.

Conclusion: There is dominance of cognitive domain in both theory and practical examinations, and student-examiner interaction is inadequate. Examination pattern should be changed to facilitate assessment of psychomotor and affective domains of learning as well, by giving more weightage to formative assessment and OSPE exercises.

Key words: Domains of learning, Bloom's taxonomy, Pharmacology, Practical examination, OSPE

INTRODUCTION:

The three domains of learning - cognitive, affective, and psychomotor - have been widely recognized in the field of education. These domains originally were proposed in 1940s by Benjamin Bloom, whose name is used to refer to this taxonomy. The Bloom's taxonomy of learning domains continues to be a widely used system for imparting medical education and for assessment of medical students across the world.[1]

Pharmacology is a vital subject in medical curriculum that is unique in the allopathic system of medicine. The subject is vast and ever-expanding.

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Knowledge in different sub-specialities of pharmacology such as pharmacovigilance, pharmacogenetics, pharmacoeconomics, clinical pharmacology, experimental pharmacology, and pharmacometrics are essential for the complete understanding of the subject. An in-depth understanding of pharmacology, across all domains of learning, will enable a medical student to use medications rationally and judiciously throughout his/her medical career.

Both learning pharmacology and its assessment should ideally cater to all the three learning domains, namely cognitive (involving knowledge about pharmacology), psychomotor (involving skills involved in drug usage), and affective (involving right attitude in drug usage). Further, a comprehensive assessment of a student's understanding of pharmacological principles can be more accurately made with a direct student-examiner interaction rather than evaluating written answers. We were curious to know whether the assessment pharmacology understanding of students during the final examinations conducted by different Universities in South India is comprehensive.

The objective of our study was to analyze the pharmacology undergraduate examination patterns of different Universities in Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, and Pondicherry, to specifically estimate:

a. The extent of contribution of different domains of learning for the overall marks in the University pharmacology examination

b. The extent of contribution of different domains of learning in the University practical pharmacology examination

c. The extent to which interaction with student is present during the University practical examination

d. The division of the University practical examination topics under various sub-headings of pharmacology

MATERIALS AND METHODS:

Since this study did not involve testing on human or animals, ethics committee clearance was not sought. The practical examination patterns of different universities were obtained either by visiting the university's website, or by contacting a faculty working in a medical college affiliated to the university, during the year 2016. The distribution of marks in the university examination was categorised under four criteria, fulfilling the study's objectives:

A. Distribution of Overall Pharmacology Examination Marks as per Domains of Learning

Cognitive domain:
All theory marks and viva marks were categorised under cognitive domain.

Practical Exercises:
Those practical exercises which involved the performance of a particular skill were classified under psychomotor domain.

Affective domain:
Since record maintenance reflects the attitude of the student towards the subject, if a university considers record maintenance for the final marks, it was categorised under affective domain. If a University considered extracurricular activities (such as seminars, symposiums, student projects etc) for the final marks, it was categorised under

affective domain, since scoring good marks in all these activities reflect a positive attitude of the student. Patient communication exercises and exercises concerning rational pharmacotherapy were also considered under affective domain.

Internal Assessment Marks: The percentage distribution of marks under different domains in the external practical examination was extrapolated to split the marks of the practical internal assessment examinations into different domains, under an assumption that the internal assessment practical examination was held in the same way as the external examination.

B. Distribution of University Practical Pharmacology Examination Marks as per Domains of Learning

Psychomotor Domain:
Those practical exercises which involved the performance of a particular skill were classified under psychomotor domain

Affective domain:
If a University has reserved marks for practical records in its final examination and not just a part of internal assessment marks, it was categorised under affective domain. Also, exercises concerning rational pharmacotherapy and patient communication were considered under affective domain.

Cognitive domain:
All the practical exercises which could not be not classified under psychomotor or affective domains were classified under cognitive domain.

C. Distribution of University Pharmacology Examination Marks by Interaction of Examiner with Students

The extent of student interaction was ascertained by speaking with the faculty of medical colleges affiliated to different universities.

D. Distribution of Pharmacology Examination Marks under Different Subheadings

Experimental pharmacology:
All practical exercises relating to performance and/or interpretation of experiments on animals, including chart interpretation

Clinical pharmacology:
All practical exercises relating to human pharmacological analysis, including prescription writing, prescription audit, pharmacoeconomics, dosage calculation, problem solving exercises, ADRs, toxicology, etc

Pharmacy / chemical pharmacology:
Practical exercises pertaining to dispensing pharmacy, dosage forms, identification of the chemical by doing tests, etc

Spotters:
Where the University has specifically asked its affiliated colleges to include this type of exercise in the examination

OSPE:
Where the University has specifically asked its affiliated colleges to include this type of exercise in the examination.

If two or more colleges belonging to the same university gave different type of information, we entered all the data and took an average of all the data for the final calculation. Data were expressed as numbers and percentages; statistical analysis was not done for the data since the study was of a descriptive nature.

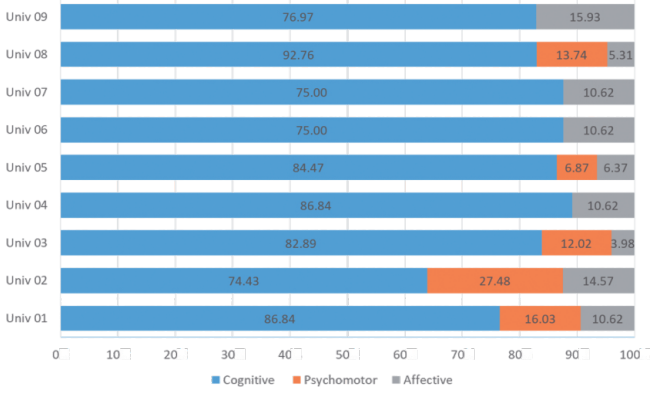
RESULTS:

A total of 20 medical colleges affiliated to nine Universities in the states of Tamil Nadu (five universities), Karnataka, Pondicherry, Andhra Pradesh, and Kerala (one university each) were included in this study. Out of the nine universities, three were deemed medical universities with multiple medical colleges affiliated to them, one was a deemed to be university with only one medical college under it, Four were Health Sciences Universities of their respective states, and one was a general University (not restricting to Health Sciences).

A. Distribution of Overall Pharmacology Examination Marks as per Domains of Learning

All the nine universities under consideration put the maximum emphasis on the cognitive domain when compared to the other two domains. On an average, the distribution of marks under the cognitive domain was 81.69%, followed by affective domain at 9.85% and the psychomotor domain at 8.46% respectively. Notably, four out of the nine universities had zero contribution from psychomotor domain. Figure 1 summarises the marks distribution under different domains.

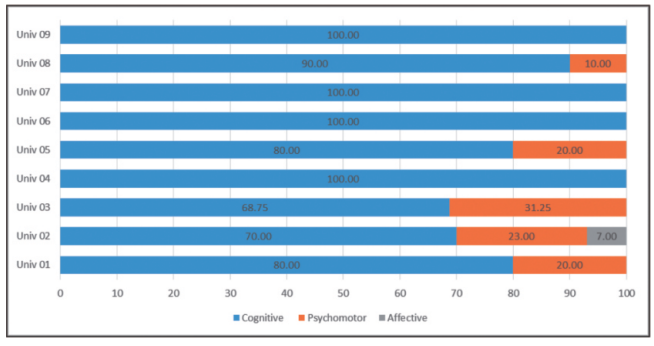
Figure 1 : Distribution of pharmacology examination marks under different domains



B. Distribution of University Practical Pharmacology Examination Marks as per Domains of Learning

The emphasis on cognitive domain continued even during the practical examination in all the nine universities under consideration. On an average, the distribution of marks under the cognitive domain was 87.64%, followed by psychomotor domain at 11.58% and affective domain at 0.78%. Only one of the nine universities tested the affective domain during practical examination (in the form of patient communication exercises). Importantly, four universities had zero contribution from the psychomotor domain, despite the heading being 'practical' examination. Figure 2 summarises the marks distribution under different domains.

Figure 2 : Distribution of pharmacology practical examination marks under different domains

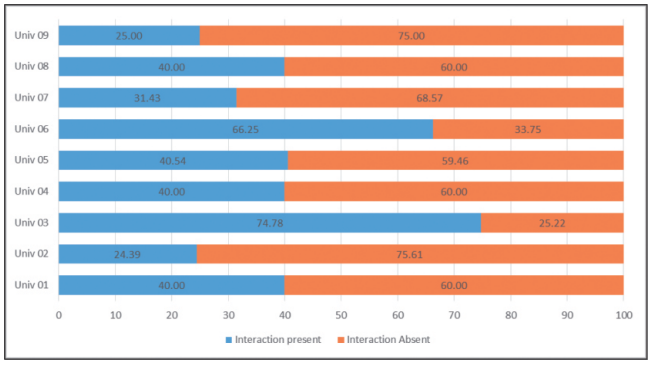


C. Distribution of University Pharmacology Examination Marks by Interaction of Examiner with Students

On an average, 56.88% of marks were awarded in practical examination without direct interaction with students. Out of the nine universities, only two universities had more proportion of questions

which involved student interaction with the examiners than those which did not. Figure 3 summarises the distribution of marks based on the level of interaction between students and examiners.

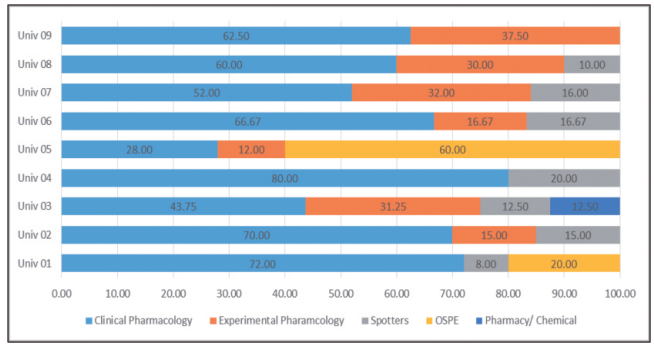
Figure 3 : Distribution of pharmacology practical examination marks based on presence or absence of interaction between student and examiner



D. Distribution of Pharmacology Examination Marks under Different Subheadings

On an average, 59.44% of questions came from topics under clinical pharmacology, and all universities had questions from this topic. Experimental pharmacology questions averaged 19.38% of questions, and barring two universities, all universities had questions from this topic. Likewise, spotters was also a question in all the universities except two, and on an average contributed to 10.91% of marks. Only one university had questions from clinical pharmacy/ chemical pharmacology, and only two universities had incorporated OSPE under their examination scheme. The distribution of marks between the different subheadings was not constant or uniform between the Universities. Figure 4 summarises the marks distribution based on the subheadings.

Figure-4: Distribution of pharmacology practical examination marks under different subheadings



DISCUSSION:

Pharmacology is an ever-changing subject. Undergraduate pharmacology teaching has undergone significant changes in the past. The changes that have happened in the field of pharmacology have had a greater impact on conducting of pharmacology practicals. In the past, pharmacology practicals consisted of experimental pharmacology involving small animals and amphibians, and dispensing pharmacy exercises, both of which required performance of skilful activities on the part of the student. With time, for various reasons, both of these exercises were removed from the undergraduate practical pharmacology teaching programmes in most of the Health Universities in India.[2] This has led to the present state where maximum emphasis is given to exercises involving clinical pharmacology while conducting and assessing practical aspects of pharmacology. This change correctly reflects the current pattern of emphasis in the subject where clinical pharmacology is given more importance; however, most of the clinical pharmacology exercises are theoretical in nature and involve very minimum psychomotor and affective domains. The increasingly theoretical nature of pharmacology practicals has resulted in second year medical students terming the pharmacology practicals as being the 'most boring and least useful' among all

the second year practical exercises, despite also considering pharmacology to be the most important second year subject.[3] Thus, it is very much apparent that there is a desperate need to make practical pharmacology more interesting and involving more active participation from the students.

The direction of medical education in India is driven primarily by the guidelines and syllabi prescribed by the medical universities. Even though medical teaching should ideally be 'knowledge-oriented', in our experience, we have seen that the medical teaching is gradually becoming 'exam-oriented'. This means that, if a change is required in the way a subject is taught, it should primarily reflect in the way the questions are framed in the examinations. Thus, our objective behind performing this analysis was to see how different medical universities conduct examinations in pharmacology. We looked at this question from three different viewpoints: (a) how much contribution is coming from different domains of learning; (b) how much emphasis is being given to interaction with students, and; (c) are the practical exercises coming from different sub-specialties of pharmacology, thus making the assessment a holistic one.

Our intention while performing this analysis was to explore whether the assessment methodologies followed by different Universities are comprehensively evaluating the pharmacology learning of the students across all domains and to what extent actual student-examiner interaction is present. Our objective was not to highlight the deficiency in the assessment method of any particular University, and for this reason, we have not disclosed the names of the individual Universities. This study has highlighted the present situation of non-uniformity of assessment during final pharmacology examination conducted by different Universities in South India.

While all the nine Universities in our study assessed the learning in the cognitive domain, the other two domains (psychomotor and affective) were assessed to a very small extent. A predominance of cognitive domain is understandable in the written (theory) examination and viva-voce, but the practical exercises should be designed and assessed in such a way that the learning of the student across all the three domains is equally assessed. Contrary to this expectation, we found in our study that in all the nine Universities, even during practical pharmacology assessment the cognitive domain is given more importance with psychomotor skill assessment contributing to only 11.58% marks.

Only one out of the nine Universities concerned had assessment involving affective domain in the practical examination; this was a patient communication exercise, and contributed 7 out of 100 marks in the practical examination. Further, the amount of interaction between the examiners and the examinees during practical examination, excluding viva, is a mere 43.12%. On a more encouraging note, we observed that the practical exercises across different Universities focus mostly on clinical pharmacology with lesser emphasis on experimental pharmacology and clinical pharmacy / chemical pharmacology, which is in accordance to the current trend in medical pharmacology. Only two out of the nine Universities considered in the study had incorporated the OSPE exercises.

The disproportionately high importance to cognitive domain at the expense of psychomotor and affective domains in the practical examination, and the fact that the extent of interaction between examiners and students during practical examination is under 50% are areas of major concern. Even though the knowledge is the prerequisite for skill and behavioural changes,

ignoring of psychomotor and affective domains of learning is counterproductive. This has been the case in the medical education in India, as acknowledged by past literature.[4] Thus, the assessment techniques should be modified in such a way that affective and psychomotor domains supplement the already predominant cognitive domain, and the amount of interaction between students and examiners is increased during both formative and summative assessments.

There are two possible methods by which such changes can be brought about in pharmacology practical assessment: (a) the weightage given to internal assessment marks should be increased, and seminars, projects etc should be included under internal assessment, and, (b) more weightage should be given to OSPE exercises.

Since medical students in India spent 3 semesters (18 months) in 2nd MBBS, formative assessment done throughout the 2nd MBBS should be an essential part of student assessment. Formative assessment assesses students' achievements, and also enables students to identify the areas in which they are facing difficulty and initiate corrective measures. Formative assessment done in optimum frequency with immediate feedback can help in the overall development of the student.[5] The inclusion of headings like seminars, student projects, quiz, participation in research, group discussions, problem-based learning and case-based learning under formative assessment not only makes the practical sessions interesting and lively, but also contributes to the affective domain (and to a small extent, psychomotor domain) of learning and assessment. In fact, the internal assessment may be modified to include very minimum theoretical questions (contributing to cognitive domain) and mostly practical questions (contributing to psychomotor and affective domains, and also involving more interaction).

However, since the internal assessment marks contributes to a very small extent to the final marks, students generally give less importance these 'co-curricular activities'. In fact, many students study only before the examinations.[2] If internal assessment is given more importance, then students will be made responsible to study from day 1. In fact, premier institutions like AIIMS Delhi allocate 50% of the total marks to internal assessment.[6] This modification should be considered by all health Universities under all subjects in general, and Pharmacology in particular.

The second suggestion concerns OSPE exercises. These exercises were derived from objective structured clinical examination (OSCE), which was originally conceptualized in 1975.[7] By the OSPE method, the competency of the examinees can be assessed objectively through direct observation. By incorporating OSPE in Pharmacology, the assessment can be made more objective, a wide area of knowledge and skills can be assessed in a short time with minimum variability, and affective and psychomotor domains also can be assessed, in addition to the cognitive domain.[8] The incorporation of OSPE exercises in the pharmacology practical examination scheme by Universities will make the student assessment more comprehensive, and will also break the monotony of the assessment. At least 50% of marks in the practical examination should be earmarked for OSPE exercises.

Examples for OSPE exercises in pharmacology include demonstration of injection techniques in mannequins, interpretation of pharmacodynamic and pharmacokinetic charts, interpretation of animal experiment results, filling up of ADR forms, criticising on the rationality (or its lack) in fixed drug concentrations, patient communication skills, rational pharmacotherapeutic exercises, etc.

The limitations of the present study includes small sample size and non-usage of statistics for analysing the data. However, by this study, we have a general idea as to how the cognitive domain is being tested at the expense of affective and psychomotor domains even in the practical examinations. Further studies in this direction including more Universities and more subjects may further corroborate our findings.

CONCLUSION:

To conclude, we found in our study that most Medical Universities in South India give more importance to cognitive domain of learning while ignoring affective and psychomotor domains under assessment of undergraduate pharmacology, and this trend is seen even during practical examination. Interaction between students and examiners is less than 50%, and clinical pharmacological exercises dominate over other sub-specialities of pharmacology. In order to enhance assessment of psychomotor and affective domains, we suggest enhancing weightage given to (a) internal assessment marks and to include student seminars and projects as components for internal assessments, and (b) OSPE exercises during practical examination. By these steps, we can go one further step in making the students realise that good knowledge in pharmacology is the bedrock for rational pharmacotherapeutics, and thus contributing to the creation of responsible doctors for the future generation.

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A modified transforaminal lumbar interbody fusion technique to decrease the incidence of postoperative radiculopathy: A prospective analysis of 216 patients

Dr. Subbiah M and Dr. Yegumuthu K

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Abstract
Reported incidence of postoperative intractable radiculopathy following posterior lumbar interbody fusion (PLIF) and transforaminal lumbr interbody fusion (TLIF) is between 7-14% affecting postoperative recovery. Excessive medial dural retraction in PLIF and exiting nerve root injury in TLIF during cage insertion are the proposed itiologies for battered root syndrome. Aim of the study was to identify the incidence of postoperative radiculopathy on the side of cage insertion following a modified TLIF technique. 216 patients who underwent fusion by modified-TLIF approach were prospectively analyzed. The inferior facet of cranial vertebra alone was excised retaining the pars interarticularis of cranial vertebra and superior facet of caudal vertebra which from the posterior wall of intervertebral foramen. It provided adequate space for cage insertion without need for excessive dural retraction in addition to protecting the exiting nerve root. The severity of postoperative radiculopathy on the side of cage insertion was assessed by visual analog scale (VAS). Of the 216 patients, L4-5 level was fused in 137, L5-S1 in 72 and L3-4 in 7 patients. Severe postoperative radiculopathy (VAS: 10) was observed only in three patients with an incidence of 1.4% who needed prolonged hospitalization for its recovery. L3-L4 was the fused level in these three patients while none of them in L4-5 and L5-S1 levels had such severe radiculopathy. Lumbar interbody fusion by modified TLIF (Hemi-TLIF) approach involving excision of only the inferior facet decreases the incidence of post-operative radiculopathy. However, we recommed this procedure only at L4-5 and L5-S1 levels where the spinal canal is relatively larger when compared to higher lumbar levels.

Keywords: Lumbar interbody fusion; PLIF; TLIF; Postoperative radiculopathy; Modified TLIF; Battered root syndrome; Hemi-TLIF

1. Introduction
Lumbar interbody fusion is commonly performed for many spinal disorders and addition of pedicle screw instrumentation improves fusion rate by providing direct vertebral stability [1, 2]. Posterior lumbar interbody fusion (PLIF) and transforaminal lumbar interbody fusion (TLIF) are the two commonly performed posterior fusion techniques. The posterior wall of intervertebral formaen through which the nerve roots exits each lumbart level is formed by the superior articular facet of caudal vertebra and pars interarticularis part of the cranial lamina. Interbody cage insertion in PLIF is done by retracting the dura through the laminectomy defect without damaging facet joints while TLIF involves fusion without dural retraction by complete excision of superior and inferior articular processes of facet joint. Of all potential complications of PLIF and TLIF, persistent post-operative severe intractable radiculopathy due to "battered root syndrome" is reported in 7-14% of patients significantly affecting their early postoperative recovery necessitating further treatment [3, 4]. This postoperative radiculitis is attributed to excessive medial retraction of traversing nerve root in PLIF and direct injury to exiting nerve root during cage insertion in TLIF [5].
We analysed the incidence of postoperative radiculopathy on the side of cage insertion in lumbar interbody fusion using a single bullet cage inserted obliquely by modified TLIF approach (Hemi-TLIF). The inferior facet of cranial vertebra alone was osteotomized retaining the superior facet of caudal vertebra and pars interarticularis part of the lamina of cranial vertebra that together form the posterior wall of intervertebral foramen to prevent injury to the

exiting nerve root in addition to providing space for cage insertion without excessive dural retraction.

2. Materials and methods

216 patients who underwent lumbar interbody fusion by modified TLIF approach using a single oblique bullet cage were prospectively analysed. The indications for surgery were lumbar spondylolisthesis, degenerative disc disease, failed back surgery syndrome and spondylodiscitis. All these patients underwent surgery as they were not responding to adequate trial of conservative management. Plain radiographs of lumbosacral spine and MRI were obtained in all patients preoperatively.

2.1. Surgical procedure

All procedures were performed by a single surgeon. The patient was postioned prone in a spinal frame under general anaesthesia after adequate padding of bony prominences. A standard posterior midline exposure of the levels to be fused was done till the lateral border pars interarticularis on both sides. Pedicle screws were inserted into the vertebrae and rods fixed. Distraction was applied between the screws to open up the disc space.

The interspinous ligament was excised and the inferior half of spinous process of cranial vertebra was nibbled till its base where it merges with the two laminae. The caudal edge of the superior lamina was removed with rongeurs till the attachment of ligamentum flavum to its anterior surface was visualized. The sagittally oriented lumbar facet joint on the side of preoperative radicular pain was exposed by excising the facet joint capsule. The inferior articular process of cranial vertebra on that side was osteotomized with a narrow osteotome starting in the midline at the level of junction between the two laminae and base of spinous process and proceeding laterally (Fig 1).

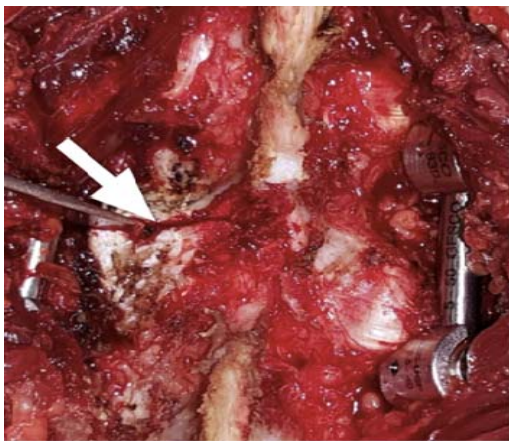

Fig 1: Intraoperative photograph showing the line of osteotomy (white arrow) of inferior articular facet.

The ligamentum flavum was retained till the osteotomy of inferior articular process was completed to prevent inadvertent entry of osteotome into spinal canal. Care was taken to prevent injury to the laterally placed superior articular process of caudal vertebra.

After excising the osteotomized inferior facet, articular cartilage of superior articular process and retained ligamentum flavum were clearly visualized (Fig 2).

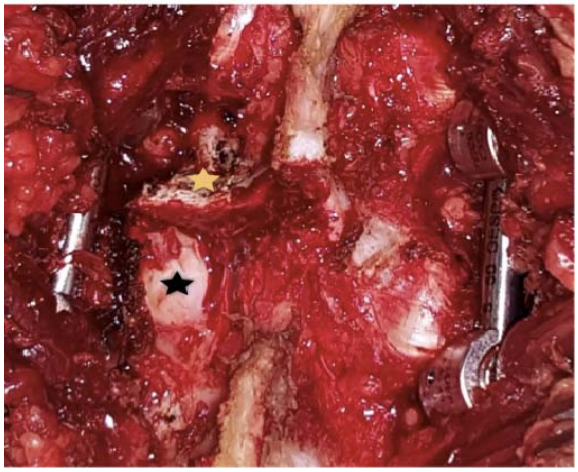

Fig 2: Intraoperative photograph after excision of inferior articular facet showing articular cartilage of preserved superior articular facet (black star) and pars-interarticularis part of cranial lamina(yellow star) which form the posterior wall of vertebral foramen protecting the nerve root.

The remaining attachment of ligamentum flavum was released from the upper border of the caudal lamina and medial border of the retained superior facet to expose the dura and traversing nerve root. The exiting nerve root above was protected by the remaining upper half of cranial lamina and the superior articular process of caudal vertebra which together form the posterior wall of vertebral foramen (Fig 2). The medial edge of the superior articular process which overhangs into the spinal canal was removed with a Kerrison rongeur to expose the disc space lateral to the dura. Discectomy was performed through this space between the dural sac and medial edge of superior articular process without retracting the traversing nerve root. Autografts from the excised spinous process and inferior articular process was packed into the disc space. A single bullet cage packed with local autografts was introduced obliquely into the disc space through the space between dura and superior articular process (Fig 3).

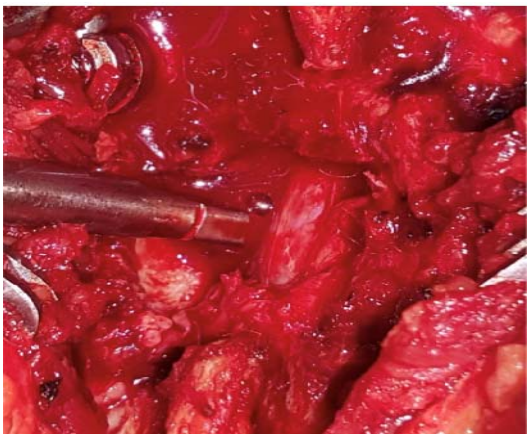

Fig 3: Intraoperative photograph showing introduction of cage through the space lateral to dural sac without dural retraction.

It was directed obliquely to be postioned in such a way that it crosses the midline in AP view (Fig 4).

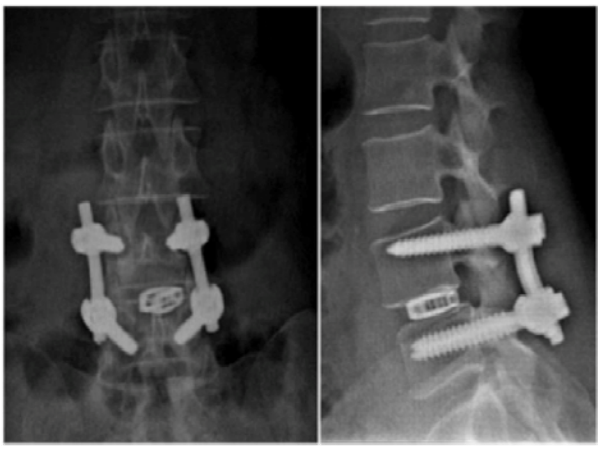

Fig 4: Postoperative anteroposterior and lateral radiograph after modified TLIF showing the position of bullet cage.

The retained cranial half of the superior lamina and the superior articular process of the caudal vertebra prevent injury to the exiting nerve root during this stage of cage insertion. The contralateral nerve root was decompressed if necessary. The pedicle screws were compressed and final tightening of the nuts done. Wound was closed in layers over a drain.

The patients were made to sit up on the first postoperative day (POD) and mobilized with a lumbosacral orthosis after drain removal on the second POD. Patients were evaluated for radicular pain in the immediate postoperative period on the side of cage insertion and when present the severity was assessed by visual analog scale (VAS) for radicular pain.

3. Results

The mean age of patients was 52 years (Range: 24-76 years) and mean duration of follow up was 26 months (Range:18-36 months). 142 patients were males and the remaining 74 were females. The indications for fusion were lumbar spondylolisthesis in majority of patients (n: 149), while other indications included spondylodisciitis(n-41), failed back surgery syndrome(n-19) and degenerative disc disease(n-7).

The mean operative time was 75 minutes and mean blood loss was 150 ml. The mean duration of hospital stay was 8 days (Range: 5-21 days). The commonest level fused was L4-5 (n-137) while L5-S1 was fused in 72 and L3-4 in 7 patients. Titanium bullet cage was used as an interbody spacer in 174 patients and poly-ether-ether-ketone (PEEK) cage was used in 42 patients.

Severe radiculopathy on the side of cage insertion was observed only in three patients in immediate post-operative period with an incidence of 1.4%. The VAS score for leg pain in these three patients was 10 and L3-L4 was the fused level in these patients. They needed prolonged hospital stay for a period of 17-21 days. However, they responded well to conservative management with steroids, opiods, NSAID's and they did not require resurgery for root decompression or rhizotomy procedures. Mild sensory disturbance in the form of paraesthesia was observed in 32 patients on the side of cage insertion (VAS<3) which did not affect their postoperative mobilization protocol. Superficial wound infection was observed in three patients who needed debridement and secondary closure of the wound while dural tear occurred in 9 patients.

4. Discussion

In addition to maintaining the load bearing capacity of spine, interbody fusion also aids in achieving sagittal spinal alignment and increases the available area of fusion bed to enhance arthrodesis [6]. Cloward in 1940 performed the first PLIF [7] which was later modified by Lin [8]. TLIF procedure was pioneered by Harms in 1998 for spondylolisthesis, scoliosis and post-discectomy syndrome [9]. The reported incidence of complications following PLIF and TLIF is 36.4% including subsidence of cage, osteolysis, dural tear, intraoperative neurological injury etc [3]. Of these, the most disabling complication is intraoperative neurological injury resulting in "battered root syndrome" which is reported to occur in 7-10% of cases causing severe post-operative radiculopathy [3, 4]. Moatz *et al* described this entity to be placing patients at increased risk even when other factors are equal when comparing TLIF/PLIF with standard PLF with instrumentation [3]. Battered root syndrome was first described by Bertrand in 1975 as a permanent radiculopathy caused by surgical trauma. He defined it as a reappearance of intractable radicular pain following the relief of sciatic pain by surgery with a constant burning character. The proposed treatment modalities for this condition when not responding to conservative management include rhizotomy, spinal cord stimulation etc. Carragee *et al* reported a complication rate of 10-50% including radiculitis, heterotopic ossification etc. associated with the use of bone morhogenetic protein(BMP) in PLIF and TLIF, however they were not able to correlate post-operative leg pain and heterotopic ossification [10]. Postoperative radiculitis was reported in 14% of patients who underwent TLIF with rhBMP-2 [11]. Humphreys *et al* attributed the need for greater retraction of dura for the high incidence of post-operative radiculitis in patients undergoing PLIF [5]. Mehta *et al*. reported an increased incidence of nerve root complications and durotomy following PLIF and TLIF and concluded that PLIF/TLIF should be performed only when the goals of surgery cannot be accomplished by decompression and traditional PLF [13].

Discectomy and interbody fusion in PLIF is done by retracting the dural sheath till midline or sometimes beyond to access the disc space without removing superior or inferior articular process. This excessive dural retraction might result in traversing nerve root damage or severe postoperative neurogenic radicular pain on that side [14]. Interbody fusion in TLIF is performed through far lateral aspect of disc space after removing the superior and inferior articular process of facet joint completely. This complete facet removal exposes the obliquely coursing exiting nerve root making it vulnerable to injury and postoperative radiculopathy in TLIF occurs due to occult injury to this exiting nerve root on the far lateral aspect when cage is inserted. Postoperative radicular pain following TLIF was reported to occur in 13.8% of patients by Burneikiene *et al* [15].

The posterior wall of intervertebral foramen through which the spinal nerve root exits is formed by lower portion of pars interarticularis of the lamina of cranial vertebra superiorly and superior articular process of caudal vertebra inferiorly [16]. Our procedure involving osteotomy of inferior articular process of cranial vertebra alone retains this posterior wall of vertebral foramen protecting the exiting nerve root in addition to providing necessary space for cage insertion without need for excessive dural retraction. Hence, we propose that the problems secondary to iatrogenic battered nerve root in PLIF and TLIF can be avoided by this technique of hemi-TLIF involving the resection of only the inferior articular process.

Persistent postoperative severe radiculopathy due to battered nerve root syndrome was reported in 7-14% of patients affecting early recovery necessitating further treatment [3, 4, 11,

[15]. Postoperative severe radiculopathy in our series of patients was less with an incidence of only 1.4% (3/216 patients). These three cases who had severe postoperative radiculopathy in our study were found to be at L3-L4 level with which we propose this procedure to be suitable only for fusions involving the L4-L5 and L5-S1 levels where the spinal canal is relatively larger than higher lumbar levels.

5. Conclusion

Lumbar interbody fusion by our modified-TLIF (Hemi-TLIF) approach involving excision of inferior facet of cranial vertebra alone provides adequate space for cage insertion without the need for excessive dural retraction in addition to preventing injury to exiting nerve root by the retained posterior wall of vertberal foramen which protects it. This procedure significantly decreased the incidence of severe post-operative radiculopathy and aids in early post-operative recovery. However, we recommed this procedure only at L4-5 and L5-S1 levels where the spinal canal is relatively larger when compared to higher lumbar levels.

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Study on The Prevalence of Imipenam Resistant Acinetobacter Species in A Tertiary Care Hospital At Madurai

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Introduction*: Acinetobacter species are aerobic gram negative coccobacilli. They are the most important nosocomial pathogens especially in critical care patients with mechanical or other artificial supports.[1,2,3] The important nosocomial infections are blood stream infections , surgical site infections, pneumonia and urinary tract infections. As these organisms are becoming resistant to aminoglycosides, fluoroquinolones, ureidopenicillins and third generation cephalosporins, Carbapenams are used to treat these infections caused by Acinetobacter species. Recently, it has been noted that these organisms show resistant for Carbapenams also. [4] This may limit the options for effective therapy for infections caused by this organism which may lead to outbreaks of Carbapenam resistant Acinetobacter species in the institution. Hence this study was designed to determine the prevalence of Imipenam resistant Acinetobacter species in varied samples received in the Microbiology laboratory at Velammal Meical College Hospital, which is a newly started tertiary care Medical college hospital at Madurai, Tamilnadu.*

Key words*: Acinetobacter, Imipenam, Isolates,ventilator associated pneumonia)*

Abbreviation: *IRAB/IRA –Imipenam resistant Acinetobacter, MDRA-Multi drug resistant Acinetobacter*

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I. Aims And Objectives

This study was conducted on 193 acinetobacter isolates from sputum, blood, pus and urine samples collected from the patients admitted at Velammal Medical college from January 2015 to December 2015 to know the following:

1. The incidence of imipenam resistant isolates.
2. Monthwise distribution of these isolates
3. The common age group and sex involved in the resistant isolates.
4. The specimen, the type of infection and the wards from where these isolates were commonly isolated.
5. The relationship of these isolates with the multidrug resistant isolates.

II. Materials And Methods

A total of 193 Acinetobacter isolates were included in this study. These isolates were from the sputum, blood, pus and urine samples collected from the patients admitted in the hospital during the period from January 2015 to December 2015. The Acinetobacter genus was identified by standard conventional techniques like gram staining, cell and colony morphology, positive catalase test, negative oxidase test and absence of motility. The antibiotic susceptibility test was done for 10 antibiotics, ampicillin, cephaloxin, ceftriaxone, ceftazidime, gentamycin, kanamycin, chloramphenicol, trimethoprim, ciprofloxacin and Imipenam by Kirby Bauer Disc diffusion method. The imipenam resistant isolates were analysed for their distribution monthwise, specimenwise, agewise, sexwise and wardwise and also for their relationship with the multiple drug resistant isolates .All the results were analysed by the computer software system, Statistical Package for the Social Sciences (SPSS)

III. Results

Out of 193 acinetobacter isolates, 120 were imipenam resistant(62.5%) and 99 were multi drug resistant(51.6%).The monthwise distribution of the isolates showed that out of 120 samples,4 were present in January(3.3%), 10 in February(8.3%), 9 in March (7.5%), 6 in April (5%), 10 in May (8.3%), 17 in June (14.1%), 9 in July (7.5%), 3 in August (2.5%),8 in September(6.6%), 20 in October(16.7%),10 in November(5.1%),14 in December(11.6%). This is given below:

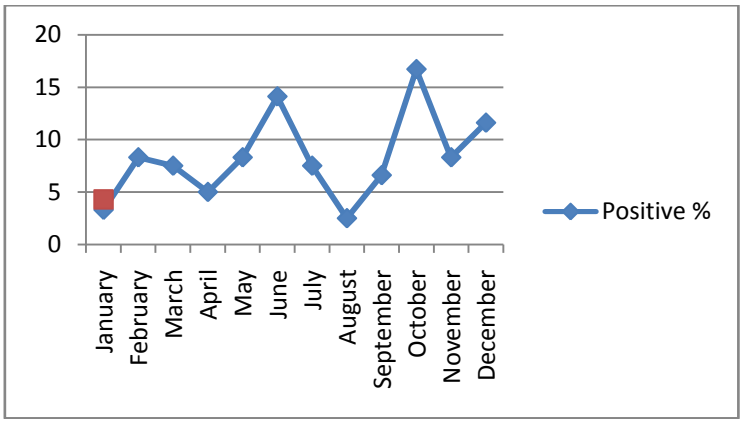

Fig.1 Monthwise Distribution of IRAB

It is seen from the graph that the incidence of Imipenam resistant Acinetobacter was more in the month of October.Imipenam resistant Acinetobacter was further analysed according to the specimens and found that 70 out of 120 were present in sputum samples (58.3%), 34 out of 120 in pus(28.3%), 11 out of120 in urine(9.1%)and 5 out of 120 in blood(4.1

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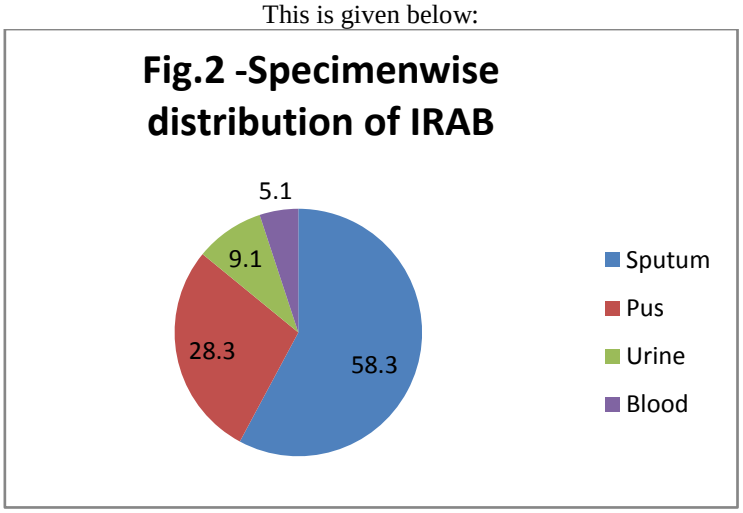
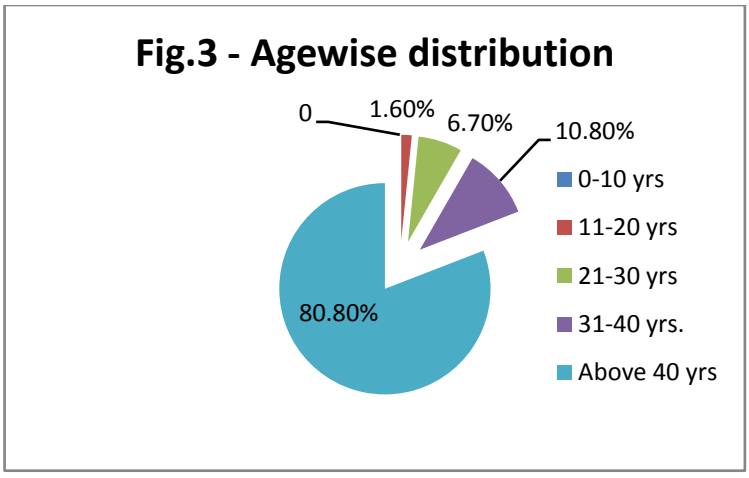


It is noted from the figure that Imipenam resistant Acinetobacter were more commonly seen in the sputum samples.The agewise distribution of Imipenam resistant acinetobacter showed that 97 out of 120 were in the age group more than 40 years(80.8%), 13 out of 120 in the age group 31-40years(10.8%), 8 out of 120 in the age group 21-30 yrs(6.7%)and 2 out of 120 in the age group 11-20 yrs,0 out of 120 in the age group 0-10 yrs. This is given below



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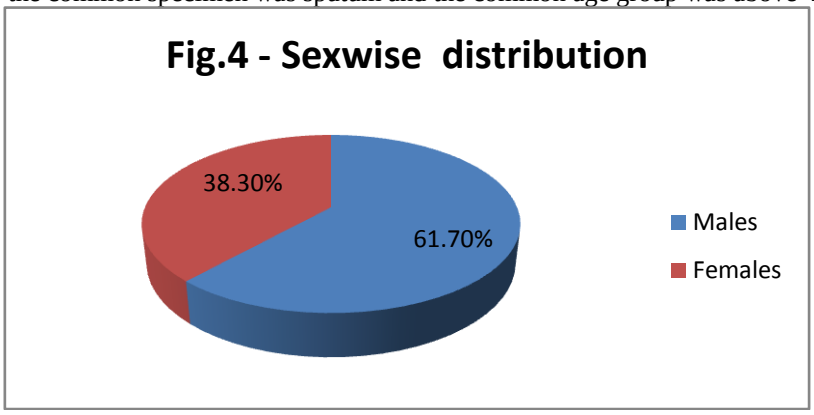
It is noted from the figure that Imipenam resistant Acinetobacter was **common in the age** group above 40 yrs. ie in adult groups.

The sexwise distribution of Imipenam resistant Acinetobcter showed that 74 out of 120 were males(61.7%) and 46 out of 120 were females(38.3%). Thus it was shown that the **males were** predominantly involved. In both sexes, the common specimen was sputum and the common age group was above 40 yrs.



The relationship of Imipenam resistant Acinetobacter with Multidrug resistant Acinetobacter showed that 99 out of 120 Imipenam resistant Acinetobacter were resistant for other drugs like CL / PIT / CTR / AK, 9 out of 11 in urine (81.8%),30 out of 34 in pus(88.2%), 5 out of 5 in blood(100%) and 55 out of 74 in sputum samples. This is given below:

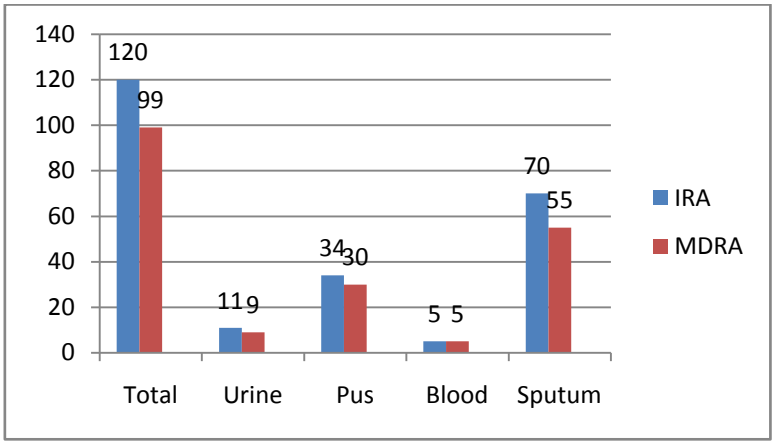
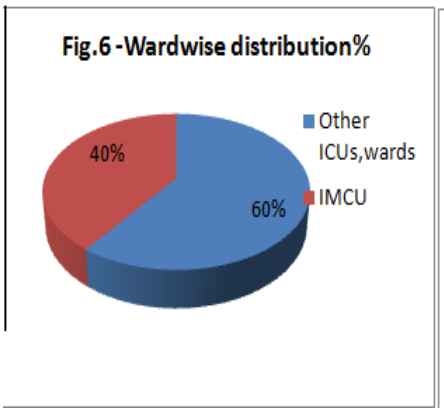
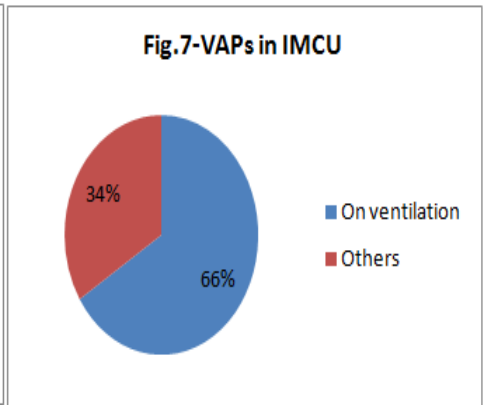


Fig.5 -Relationship of Imipenam resistant Acinetobacter and Multi drug resistant Acinetobacter

It is observed that 82.5% of imipenam resistant acinetobacter were resistant for other antibiotics also. Both imipenam resistant acinetobacter and multi drug resistant acinetobacter were common in **sputum samples**.

It was also noticed that 48 out of 120 (40%) IRAB isolates were from IMCU(Intensive medical care unit)and the remaining from other ICUs and wards. In the IMCU, out of 48 isolates, 32 isolates (66.6%)were from the sputumof patients on ventilators. Hence **ventilator associated IRAB**





were common in this hospital especially in **high risk areas like IMCU**.

IV. Discussion

This study showed that 62.5% of the acinetobacter isolates were imipenam resistant which is similar to the study by Gulseran Baran et al [8] who showed that 53.7% were imipenam resistant in their study due to colonisation of these organisms in the devices used on these patients. This study revealed that Imipenam resistant acinetobacter was very common in June which is post summar and October which is post monsoon. Kalina et al [10] in their study revealed that Acinetobacter was common during post summar which is in supportive of this study. They explained that Summar weather affects the natural and hospital environment promoting nosocomial transmission of acinetobacter species. Ambient temperature may promote a biofilm in tap water which is used for various purposes in the hospital. These may be the reasons for the presence of acinetobacter in this study also. Being a hydrophilic organism, acinetobacter colonises aquatic environment hence survives in hospital environment during post monsoon season which was seen in this study.In this study it was shown that imipenam resistant acinetobacter were commonly isolated from the sputum samples of patients (58.3%) which was supported by the studies of Namita et al [11]and Villers et al [9] who had shown 57.4% and 48.8% respectively. As Acietobacter is a fast colonising organism in respiratory tract, higher rate of isolation is possible in sputum samples.It was shown in this study, that 61.7% of imipenam resistant acinetobacter isolates were from males which is contrary to the findings of Anuradha et al **[12]** who showed that females were commonly involved . Male preponderance may be due to non modifiable risk factors making them prone for more infection.

It was proved in this study that 80.8% were above 40 yrs. Similar study by Anuradha et al [12] showed more than 60 yrs. was the common age involved. The involvement of old age group is mainly due to co morbid conditions and waning immunity which are commonly seen in the aged. Among the sputum samples, 40% were from patients admitted in ICUs. Namita et al showed 59.6% patients in their study were from ICUs and Siau et al [14] showed 43.8% were from ICUs . More incidence of Acinetobacter in ICU was due to very sick uncompromised patients with indwelling devices and poor adherence rates of hand hygiene shown by the health care workers. In this study, 66.6% patients in ICU were on ventilators showing that Acinetobacter was common in VAP cases as it involves organ system with high fluid content ie the respiratory tract .As it is a colonising organism it is easily get attachéd to ventilators which are in close proximity to the respiratory tract.In this study, 83.5% IRAB were resistant for other antibiotics also. This is similar to the results shown by Navon et al(76%)[13] and Bijayini Behara (82%)[15] . It is mainly due to injudicious use of antibiotics in ICUs and lack of regulation in the antibiotic policy of our set up.

V. Summary

The study on the prevalence of Imipenam resistant acinetobacter showed that 62.5% isolates collected during January 2015- December 2015 were from imipenam resistant acinetobacter species. From the isolates,14.1% were isolated in the month of June and 16.7% in October. Among the isolates, 80.8% were isolated from age group more than 40 years predominantly in males(61.7%) and 58.3% isolates were from sputum samples and 40% of the isolates from sputum samples were from the patients admitted in the IMCU. In the IMCU, 66.6 % patients were on ventilators. Among the IRAB, 82.5% were multi rug resistant.

VI. Conclusion

The study on the prevalence of Imipenam resistant Acinetobacter species in a tertiary care hospital at Madurai revealed that IRAB was common during June and October in the sputum samples of males more than 40 yrs. old admitted in IMCU with ventilator support. Most of these isolates are multi drug resistant.

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Clinicomicrobiological profile and antibiotic resistance analysis of diabetic foot ulcer from a tertiary care hospital

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Abstract:

BACKGROUND

Diabetic foot ulcer (DFU) is a common complication of diabetes mellitus accounting for 30% of hospital admissions among diabetics. If not treated appropriately DFU infection complicates as amputation, sepsis and even mortality. Knowledge about local microbiological profile with their resistance pattern are essential for every institute to aid in formulating antibiotic policy, thus reducing the economic burden and improve the quality of life.

MATERIALS AND METHODS

A total of 100 in-patients with DFU of Grade 2 and above as per Wagner's classification were included in our study. After obtaining the informed consent exudates, tissue biopsy or swabs were collected in a sterile container and further processed in microbiology lab.

RESULTS

All were male participants with mean age of 56.32 years; 74% had mean diabetic duration of 8.2 years. Common predisposing factors were neuropathy, trauma; 54% had single and 46% had multiple ulcers. Even though many on regular treatment for diabetes, DFU as a complication is

increasing. Total of 80% (80/100) were culture positive yielding 92 isolates, of which Gram negative organisms (72/92) were predominant; 15% (12/80) were polymicrobial. Pseudomonas aeruginosa was the commonest isolate in both single and multiple ulcer emphasising that non-fermenting Gram negative bacilli are in a raising trend. Among our isolates, 40% were Methicillin resistant Staphylococcus aureus, 47.3% were carbapenem resistant Enterobacteriaceae and 80% of Acinetobacters were multidrug resistant.

CONCLUSION

Local microbiological profile, resistance pattern, proper wound care will significantly diminish the complications of DFU and also aid in formulating the Institutional antibiotic policy.

KEYWORDS

Diabetic Foot Ulcer; Microbiological Profile; Antibiotic Resistance.

Full Text:

BACKGROUND

Diabetes mellitus (DM), a common metabolic disorder affecting various age groups is a major health issue, which remains an important cause of morbidity and mortality in various parts of the globe,[1] which is more pronounced in India.[2] Prevalence of DM is rapidly rising at an alarming rate all over the globe, especially in India which accounts for 69.2 million people with DM.[3] Burden of disease along with its complications makes the entire issue more complex. Common complications of DM include cardiovascular diseases, stroke, renal failure, leg amputation due to ulcer, blindness and nerve damage.[4] About 25% of diabetics develop diabetic foot ulcer (DFU) in their lifetime,[5] which accounts for more than 30% of hospital admissions among diabetics.[6] Complications of diabetic foot in turn leads to lengthy hospital stay, amputation, sepsis and even mortality.[4,7,8] Infections of diabetic foot ulcer is multifactorial. Bacterial causes of DFU are highly variable and their pattern varies with geographical region, underlying complications and patient population under study.[7,9] Moreover, antibiotic resistance, economic burden, compromise in quality of life due to amputation are common outcomes of this condition.[10]

Management of DFU is an equally complex and a difficult task to execute due to various factors. In addition to this, polymicrobial aetiology and multidrug resistance strains narrow down the choice of antibiotics used to treat the condition adding complexity to the entire issue.[11] So knowledge about the local microbiological profile of DFU with their resistance pattern and common predisposing factors are the essential factors for every institute to have the wellestablished antibiotic policy against DFU, which in turn reduces the economic burden and improve the quality of life.

Our study aimed at isolating the aerobic bacterial organisms from DFU patients along with their resistance pattern, which will be helpful to the clinician to initiate an appropriate empirical therapy.

MATERIALS AND METHODS

This descriptive study was carried out in Velammal Medical College and Research Institute, Madurai, Tamilnadu for a period of 6 months (September 2016 to February 2017) after obtaining the Institutional Ethics Committee approval (IEC Ref No.: VMCIEC/12/2016). Informed consent was obtained from each patient. A total of 100 consecutive in-patients with the clinical diagnosis of diabetic foot ulcer of Grade 2 and above as per Wagner's classification were included in the study. Non-diabetic foot ulcer patients, Wagner's classification Grade 1 diabetic foot ulcers, outpatient department DFU patients, past history of amputation and those not willing for participation were excluded from the study.

Sample Collection

After obtaining an informed consent from the participant, a structured proforma was used to fill the demographic, clinical and microbiological investigation details. Ulcer was cleaned with sterile saline. Exudate from the ulcer or tissue biopsy was collected in a sterile container. Alternatively, if swabs were used to collect the sample, two sterile swabs, one for gram staining and another for culture was used. The collected samples were transported to the microbiology lab as early as possible for further processing.

Processing

Gram staining was done on the sample and the findings were recorded. The sample was inoculated into Blood agar and MacConkey agar and incubated at 37[degrees]C for 24 hours. After overnight incubation, plates were examined for growth. Gram staining of the culture was done and the observations were recorded. Final identification of the organisms were based on the conventional techniques.

Antibiotic Susceptibility Testing

Antibiotic susceptibility testing was performed on Mueller-Hinton agar by Kirby-Bauer disc diffusion method as per CLSI guidelines. Antibiotic discs and Va E strip were commercially obtained from Hi-Media Laboratories. Following antibiotic discs and Va E strip were used in our study.

For Gram positive isolates- Penicillin (P), Cefoxitin (CX), Clindamycin (CD), Erythromycin (E), Gentamicin (G), Amikacin (AK), Ciprofloxacin (CIP), Cotrimoxazole (COT), Netilmicin (NET), Doxycycline (DO), Linezolid (LZ) and Vancomycin (VA).

For Gram negative isolates- Ceftriaxone (CTR), Ceftazidime (CAZ), Cefepime (CPM), Cotrimoxazole (COT), Ciprofloxacin (CIP), Levofloxacin (LE), Amikacin (AK), Gentamicin (G), Netilmicin (NET), Doxycycline (DO), Piperacillin-Tazobactam (PIT), Imipenem (IMP) and Colistin (CL) were used.

RESULTS

A total of 100 patients of diabetes with at least Grade 2 Wagner's classification of foot ulcers were enrolled in our study. All of them were males and known case of type 2 diabetes mellitus. Age range of study population was 34 to 74 years with the mean age of 56.32 years.

Among the study population, major group (74%) of DFU patients were with the diabetic duration of 1 - 10 years with the mean diabetic duration of 8.2 years followed by 16% were with 11 - 20 years diabetic, 8% were with 21 - 30 years diabetic and 2% does not know their diabetic status on presentation.

Among the study population, 48% were from rural setting and 52% were from urban setting. Most common predisposing factor for DFU among the study population was neuropathy 48% followed by trauma 30%, systemic hypertension and retinopathy 8%, nephropathy 4% and coronary artery disease 2%.

In our study population, 62% were on regular treatment. Among this 74% people were on oral hypoglycaemic agents, 12% were on insulin, another 14% were on both insulin and oral hypoglycaemic; 2% of the study population was not on any treatment.

On analysing the ulcer, 54% had single ulcer and 46% had multiple ulcers. All the subjects had ulcer in the sole of the foot, especially on the base of the toe and the heel. All ulcers were grade 2 as per Wagner's classification.

Among 100 samples collected 80% were culture positive. These 80 samples yielded 92 isolates. Among them 72 were Gram negative organisms and 20 isolates were Gram positive organisms.

A total of 15% (12/80) of cases revealed polymicrobial isolates. The commonest combinations were 8 cases Klebsiella pneumoniae with Proteus mirabilis, 2 cases were Klebsiella pneumoniae with Acinetobacter and 2 were Escherichia coli with Beta Haemolytic Streptococci.

Among the Gram negative isolates n= 72, 38 (52.7%) were Enterobacteriaceae (Figure 1) and 34 (47.2%) were non-fermenting Gram negative bacilli (NFGNB).

Among the NFGNB, Pseudomonas aeruginosa was the commonest isolate 70.5% (24/34) followed by Acinetobacter baumannii 29.4% (10/34). In the Gram positive isolates, Staphylococcus aureus was the predominant isolate (Figure 2).

Pseudomonas aeruginosa (24/92= 26%) was the commonest pathogen isolated in both single as well as multiple ulcer followed by Klebsiella pneumoniae (16/92= 17.4%), Staphylococcus aureus (10/92= 10.9%) and Acinetobacter baumannii (10/92= 10.9%) (Table 1).

Pseudomonas aeruginosa followed by Klebsiella pneumoniae and Acinetobacter baumannii were the common isolates in single ulcer DFU patients, whereas Pseudomonas aeruginosa followed by Escherichia coli and Staphylococcus aureus were the common isolates among the multiple ulcers DFU patients.

Among the Gram negatives, 18 isolates of the total 38 (47.3%) were Carbapenem resistant Enterobacteriaceae strains (CRE). Among the NFGNB, 80% of Acinetobacter baumannii were multidrug resistant. A total of 40% of Staphylococcus aureus isolates were MRSA (Table 2 and 3).

Organisms	Number of Isolates (Percentage)
Pseudomonas aeruginosa	24 (26%)
Klebsiella pneumoniae	16 (17.4%)
Staphylococcus aureus	10 (10.9%)
Acinetobacter baumannii	10 (10.9%)
Escherichia coli	8 (8.7%)
Proteus vulgaris	6 (6.5%)
Proteus mirabilis	6 (6.5%)
Beta-haemolytic Streptococci	4 (4.3%)
Enterococcus faecalis	2 (2.17%)
Enterococcus faecium	2 (2.17%)
Coagulase Negative Staphylococcus	2 (2.17%)
Enterobacter species	2 (2.17%)

Table 1. Organisms Isolation among Study Population

DISCUSSION

Chronic non-healing foot ulcer is one of the most common complications encountered by diabetic patients which may occur due to several factors like neuropathy, vasculopathy and trauma accounting for up to 30% of diabetes-related hospital admissions.[12-14] Such chronic long-standing ulcers in diabetic patients are more prone for bacterial infections that spread rapidly which may end up in significant morbidity, increasing economic burden to the patients in the form of prolonged hospital stay, laboratory and drug costs, lower extremity amputations, sepsis and even mortality.[15-18] Knowledge about microbiological profile of DFU with their sensitivity pattern, targeted therapy and high standard of care of ulcer are essential to diminish the detrimental consequences associated with diabetic foot ulcers and to significantly improve the outcome.

A total number of 100 diabetic patients with Wagner's classification grade 2 were enrolled in our study. All of them were males between 34 to 74 years with the mean age of 56.32 years. Our findings were in concordance with studies carried out by Patil SV et al,[19] Ramani et al[20] and Viswanathan et al[21] who also reported that DFU was most common among males and late

50's age group. Male predominance may be due to the factors that males spend more time in outdoor works and exposure to traumas may be higher in these groups. Common prevalence among late 50's might be due to altered immune responses, occurrence of neuropathy and vasculopathy were more evident in these groups as the disease progress.

Isolates (Numbers)	CAZ	CTR	CPM	CIP	COT	AK	G	NET	LE	DO	PIT	IPM	CL
Klebsiella pneumoniae	10	10	8	10	8	12	14	2	2	4	10	8	0
Escherichia coli	4	4	4	4	8	2	4	3	4	8	4	4	0
Pseudomonas aeruginosa	2		2	0		4	6	2			2	2	0
Acinetobacter baumannii	8	8	8	8	10	8	8	8	4	8	6	6	0
Proteus mirabilis	4	4	4	3	3	4	4	4			2	2	
Proteus vulgaris	3	3	3	3	3	4	4	4			3	3	
Enterobacter species	1	1	1	0	1	1	1	0	1	1	1	1	0

Table 2. Resistance Pattern- Gram Negative Isolates

In our study, 74% of the DFU were found out in patients with diabetes duration of 1 - 10 years with the mean of 8.2 years. Our study findings were similar to the findings of Viswanathan et al[21] and Patil SV et al[19] who also reported that mean diabetic duration was 9 years. Our study results depict that occurrence of DFU starts even with diabetic duration of 1 year. Infections among these DFUs increase proportionately with duration of diabetes as all the diabetic foot yielded growth in the patients with diabetic duration of > 10 years.

Among the study population, 48% were from rural and 52% were from urban setting. Though the diabetes is prevalent among the urban population, no significant difference was found in the DFU prevalence between urban and rural diabetic population.

Most common predisposing factor for DFU was neuropathy (48%) followed by trauma (30%), which was similar to the results of Ramani et al[20] and EM Shankar et al,[22] but discordant with the findings of Reiber et al[23] and Patil SV et al[19] who reported that history of trauma was the main predisposing factor. Discordance may be due to the fact that our patients not able to recollect the trauma history and neuropathy in diabetes also showing raising trend. Loss of sensation from neuropathy results in failure to perceive damage caused by trauma- such as penetration of pointed objects, excessive heat or friction from bad fitting shoes which in turn leads to ulcer. Though, 62% of our study population were on regular treatment, occurrence of DFU as a complication has shown increasing trend.

Isolates (Numbers)	P	CX	E	CD	CIP	COT	DO	AK	G	NET	LZ	VA E Strip
Staphylococcus aureus (10)	10	4	6	2	10	2	2	6	2	0	0	0
Beta-haemolytic Streptococci (4)	0		0	0			0				0	0
Coagulase negative Staphylococcus (2)	2	2	2	1	2	1	1	2	2	2	0	1
Enterococcus faecalis (2)	1								1		0	0
Enterococcus faecium (2)	2								2		0	0

Table 3. Resistance Pattern- Gram Positive Isolates

On analysing the ulcer type, 54% had single ulcer and 46% had multiple ulcers. Ulcers were most commonly present either in base of the toes or heel, which was in concordance with the study report of Shanmugam P et al. [24]

Among the 100 samples collected, 80% (80/100) were culture positive which yielded 92 isolates in total. Of these, 85% (68/80) were monomicrobial aetiology and 15% (12/80) were polymicrobial which was almost similar to the results of Scot E Dowd et al[25] and Sharma VK et al,[26] who reported 16% and 19% of polymicrobial infections respectively.

Of the 92 isolates, 72 isolates were Gram negative organisms and 20 isolates were Gram positive organisms which emphasises that Gram negative organisms are the predominant aetiology of DFU than Gram positive organisms which was similar to the results of Shankar et al,[22] Gadepalli et alm and Sharma VK et al.]26]

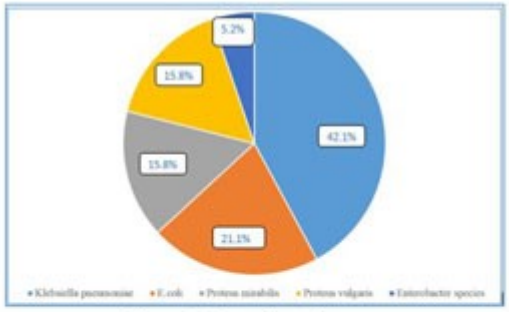

Figure 1. Enterobacteriaceae Isolation among DFU

	Isolation (%) of the 38 Isolates
Klebsiella pneumoniae	42.1
E. coli	21.1
Proteus mirabilis	15.8
Proteus vulgaris	15.8
Enterobacter species	5.2

Among the Gram negative isolates, though Enterobacteriaceae (52.7%) were predominant, nonfermenting Gram negative bacilli (NFGNB) are showing the raising trend. Among the Enterobacteriaceae Klebsiella pneumoniae was the commonest isolate (42.1%) and among the NFGNB Pseudomonas aeruginosa was the commonest isolate (70.5%), which was in concordance with the study report of Sharma VK et alJ26] Also our study reveals that Pseudomonas aeruginosa was the commonest pathogen isolated in single as well as multiple ulcer followed by Klebsiella pneumoniae was the second common isolate in single ulcer. Escherichia coli was the second common isolate in multiple ulcers.

Among the Gram positive isolates, Staphylococcus aureus (50%) was the common isolate followed by Streptococci (20%). Coagulase negative Staphylococcus (10%), Enterococcus faecalis and Enterococcus faecium (10% each) show the increasing trend.

Antibiotic resistance pattern revealed 40% of Staphylococcus aureus isolates were MRSA. Among the Enterobacteriaceae, 47.3% were Carbapenem resistant Enterobacteriaceae strains (CRE). Among the NFGNB 80% of Acinetobacter baumannii were multidrug resistant, which is the alarming note has to be effectively managed.

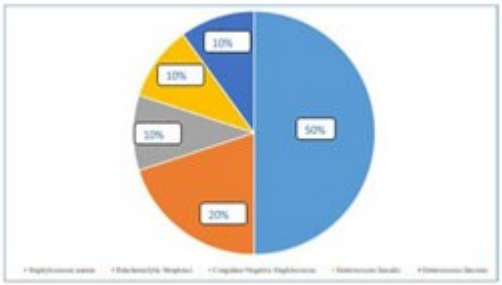

Figure 2. Gram Positive Isolation among DFU Patients

	Isolation (%) of the 20 Isolates
Staphylococcus aureus	50
Beta-haemolytic streptococci	20
Coagulase Negative Staphylococcus	10
Enterococcus faecalis	10
Enterococcus faecium	10

CONCLUSION

Our study reveals that DFU increases proportionately with duration of diabetes and neuropathy was the most common complication. Even though 62% were on regular treatment for diabetes,

occurrence of DFU as a complication has shown increasing trend. Total of 80% (80/100) were culture positive, which yielded 92 isolates. DFU was most commonly present either in base of the toes or heel and 15% of the infections were of polymicrobial aetiology. Our study emphasise that Gram negative organisms were the predominant and Pseudomonas aeruginosa was the most common pathogen in both single as well as multiple ulcer. Among our isolates 40% were MRSAs, 47.3% were CREs and 80% of Acinetobacters were MDR. Emergence of CRE, MDR and MRSA add complexity to the whole issue. This is a challenging situation, especially in diabetic population where healing mechanisms are compromised. Awareness about the disease, its complications, multidisciplinary approach, patient compliance to treatment modalities and good family support are essential in combating this metabolic disorder and its complications.

Implications

Our study emphasises that DFU can occur as early as one year after the onset of diabetes even in patients who are on regular treatment; that implies early screening for neuropathy (podiatric care, peripheral nerve conduction studies and advocating appropriate footwear) should be included in the early stages of diabetes. Neuropathy augmented with trauma paves way for injury, ulceration and delayed wound healing, complicates the entire issue. In the absence of proper foot care, infection sets in. In the hospital environment, multidrug pathogen causes havoc and make treatment more complicated and increases the economic burden. So proper screening for neuropathy in early diabetics can prevent this complication in a large number of diabetic populations.

As Gram negative organisms (mainly Pseudomonas and Klebsiella pneumoniae) are the most common organism in our setup and more than 50% showing sensitivity to beta lactam/inhibitor combinations, we recommend our clinician to start with Piperacillin-Tazobactam (PIT) as an initial drug; and we made culture and sensitivity testing as mandatory for all DFU to aid the targeted therapy which in turn prevents the spread of disease, unnecessary antibiotic use and increased health care costs.

Applications

Knowledge about the disease, its complications, local microbiological profile with resistance pattern, targeted therapy with multidisciplinary approach of wound care and good family support are essential in combating this metabolic disorder and its complications which in turn prevents the spread of disease, unnecessary antibiotic use and increased health care costs and also makes clinician more informed treatment decision regarding the use of novel therapeutics.

Key Features

* Study highlights Diabetic foot ulcer (DFU) showed increasing trend, even though many of them were on regular treatment for diabetes.

* Depicts that occurrence of DFU starts even with diabetic duration of 1 year with mean diabetic duration of 8.2 years and most common predisposing factors were neuropathy, trauma.

* Emphasises that 80% of DFUs were culture positive, of which Gram negative organisms were predominant; 15% were of polymicrobial aetiology.

* Pseudomonas aeruginosa was the commonest isolate in single and multiple ulcers emphasising that nonfermenting Gram negative bacilli are in a raising trend.

Depicts the alarming status of antibiotic resistance pattern of 40% Methicillin resistant Staphylococcus aureus, 47.3% Carbapenem resistant Enterobacteriaceae and 80% Acinetobacters were Multidrug Resistant.

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Table 1. Organisms Isolation among Study Population

Organisms	Number of Isolates (Percentage)
Pseudomonas aeruginosa	24 (26%)
Klebsiella pneumoniae	16 (17.4%)
Staphylococcus aureus	10 (10.9%)
Acinetobacter baumannii	10 (10.9%)
Escherichia coli	8 (8.7%)
Proteus vulgaris	6 (6.5%)
Proteus mirabilis	6 (6.5%)
Beta-haemolytic Streptococci	4 (4.3%)
Enterococcus faecalis	2 (2.17%)
Enterococcus faecium	2 (2.17%)
Coagulase Negative Staphylococcus	2 (2.17%)
Enterobacter species	2 (2.17%)

Table 2. Resistance Pattern- Gram Negative Isolates

Isolates (Numbers)	CAZ	CTR	CPM	CIP	COT	AK	G
Klebsiella pneumoniae	10	10	8	10	8	12	14
Escherichia coli	4	4	4	4	8	2	4
Pseudomonas aeruginosa	2		2	0		4	6
Acinetobacter baumannii	8	8	8	8	10	8	8
Proteus mirabilis	4	4	4	3	3	4	4
Proteus vulgaris	3	3	3	3	3	4	4
Enterobacter species	1	1	1	0	1	1	1

Isolates (Numbers)	NET	LE	DO	PIT	IPM	CL
Klebsiella pneumoniae	2	2	4	10	8	0
Escherichia coli	3	4	8	4	4	0
Pseudomonas aeruginosa	2			2	2	0
Acinetobacter baumannii	8	4	8	6	6	0
Proteus mirabilis	4			2	2	
Proteus vulgaris	4			3	3	
Enterobacter species	0	1	1	1	1	0

* Ceftazidime (CAZ), Ceftriaxone (CTR), Cefepime (CPM), Cotrimoxazole (COT), Ciprofloxacin (CIP), Levofloxacin (LE), Amikacin (AK), Gentamicin (G), Netilmicin (NET), Doxycycline (DO), Piperacillin-Tazobactam (PIT), Imipenem (IMP), Colistin (CL)

Table 3. Resistance Pattern- Gram Positive Isolates

Isolates (Numbers)	P	CX	E	CD	CIP	COT
Staphylococcus aureus (10)	10	4	6	2	10	2
Beta-haemolytic Streptococci (4)	0		0	0		
Coagulase negative Staphylococcus (2)	2	2	2	1	2	1
Enterococcus faecalis (2)	1					
Enterococcus faecium (2)	2					

Isolates (Numbers)	DO	AK	G	NET	LZ
Staphylococcus aureus (10)	2	6	2	0	0
Beta-haemolytic Streptococci (4)	0				0
Coagulase negative Staphylococcus (2)	1	2	2	2	0
Enterococcus faecalis (2)			1		0

Enterococcus faecium (2)	2	0

Isolates (Numbers)	VA E Strip
Staphylococcus aureus (10)	0
Beta-haemolytic Streptococci (4)	0
Coagulase negative Staphylococcus (2)	1
Enterococcus faecalis (2)	0
Enterococcus faecium (2)	0

* Penicillin (P), Cefoxitin (CX), Clindamycin (CD), Erythromycin (E), Gentamicin (G), Amikacin (AK), Ciprofloxacin (CIP), Cotrimoxazole (COT), Netilmicin (NET, Doxycycline (DO), Linezolid (LZ), Vancomycin (VA).

Figure 1. Enterobacteriaceae Isolation among DFU

	Isolation (%) of the 38 Isolates
Klebsiella pneumoniae	42.1
E. coli	21.1
Proteus mirabilis	15.8
Proteus vulgaris	15.8
Enterobacter species	5.2

Figure 2. Gram Positive Isolation among DFU Patients

	Isolation (%) of the 20 Isolates
Staphylococcus aureus	50
Beta-haemolytic streptococci	20
Coagulase Negative Staphylococcus	10
Enterococcus faecalis	10
Enterococcus faecium	10

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Acute Psychosis and Takayasu Vasculitis

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ABSTRACT

Takayasu arteritis is one of the large vessel vasculitis with variable clinical features in Indian patients. It is common in males and may be associated with tuberculosis and often presents with large vessel wall inflammation, obstruction and aneurysm. A 23-year-old female presented with features of acute psychosis and during evaluation and following electroconvulsive therapy she was found to be tachycardic and pulse less in one arm. Further CT angiogram proved features of aortoarteritis with raised inflammatory markers and her infective screen including TB came back as negative. She was treated with steroids, losartan and corticosteroids and Methotrexate was added as steroid sparing immune suppression. She remains disease free and doing well. Literature review suggests increasing incidence of this vasculitis and early effective treatment helps to reduce morbidity and prolong disease free remission.

Keywords: Takayasu vasculitis, Occluded carotid, Depression

INTRODUCTION

Takayasu arteritis is the commonest type of large vessel vasculitis. Ishikawa defined clinical groups based on the natural history and complications of the disease [1]. The four most important complications were defined as Takayasu retinopathy, Secondary hypertension, aortic regurgitation, and Aneurysm formation. (Each graded as mild/moderate or severe at diagnosis). Different ethnic populations manifest with variable disease presentation as illustrated by Moriwaki, et al. in their study of Indian and Japanese patients [2]. The Japanese patients were mostly female presenting with fatigue, dizziness, vertigo, pulselessness, more aortic regurgitation, reflecting involvement of the aortic arch and its main branches. This was very different compared with the Indian patients [2]. They tended to present with headache and hypertension due to vasculitis affecting the abdominal aorta and renal vessels.

CASE PRESENTATION

A 23-year-old female presented with two weeks history of talking to self, agitated and insomnia and found wandering on the streets. There was no history of fever, headache, or trauma. She was in acute psychosis. She was married and was in a difficult relationship. She was treated with oral antipsychotics. Her basic blood investigations were normal except ESR of 38 mm/hr. As she did not respond to the treatment she was given electroconvulsive therapy (ECT) and following ECT she was found to have tachycardia which settled afterwards. ECG following ECT showed T inversion in inferior leads.

Following cardiology review, she was found to have carotid and subclavian bruit and her CT angiogram showed occluded left common carotid and left subclavian artery, stenosed celiac axis bulb and diffusely thickened aorta. Echo showed good left ventricular function. Her immunology all came back normal. Quantiferon test for TB was

negative. Her chest imaging was normal. The diagnosis was Large vessel vasculitis-Takayasu arteritis pattern with schizophrenia. She was commenced on immunosuppression.

This is a unique presentation and although it was chance association, asymptomatic vasculitis presenting as an acute psychosis is unexplained.

CLINICAL FEATURES

The disease commonly presents in late 20s often with a long delay in diagnosis. The National Institute of Health study by Kerr, et al. suggested that the delay in diagnosis was longer in juveniles, being up to four times that of adult patients [3]. Hypertension was the commonest mode of presentation (51.3%) and was detected in 82 patients (77.4%) at the time of presentation in a study by Jain, et al. Systemic features include fever, night sweats, malaise, weight loss, arthralgia, and anemia [4]. As the inflammation progresses and vessel gets occluded, more characteristic features appear with the development of collaterals.

The most commonly affected vessels are the subclavian and common carotid arteries. Stenotic lesions are found in >90% of patients, whereas aneurysms are reported in approximately 25%. Pulmonary arteries are involved in up to 50% of patients and it is important to look specifically for evidence of aortic valve regurgitation and coronary arteritis [5]. In Indian patients, vasculitis generally occurs in the abdominal aorta affecting renal arteries and may extend into the thoracic aorta within a decade [2].

Takayasu arteritis can be divided into the following six types based on angiographic involvement based on Angiography [5]:

- **Type I** - Branches of the aortic arch
- **Type IIa** - Ascending aorta, aortic arch, and its branches
- **Type IIb** - Type IIa region plus thoracic descending aorta
- **Type III -** Thoracic descending aorta, abdominal aorta, renal arteries, or a combination
- **Type IV** - Abdominal aorta, renal arteries, or both
- **Type V** - Entire aorta and its branches

Etiology/Demographics

Although the definite etiology is unknown, the major pathology is inflammatory, with several proposed factors including spirochetes, mycobacterium tuberculosis, and streptococcal organisms and circulating antibodies due to an autoimmune process. Although Mycobacterium tuberculosis has been implicated in the pathogenesis of Takayasu's arteritis (TA), there is no direct evidence substantiating the association [6].

Takayasu arteritis is observed more frequently in patients of East Asian or Indian descent. Approximately 80% of patients with Takayasu arteritis are women [7]. Takayasu arteritis is progressive or relapsing/remitting and requires immunosuppressive treatment for disease remission and maintenance.

Prognosis

The complications of Takayasu arteritis can be severe and although medical and cardiothoracic interventions have improved, still lot more to be done to improve the prognosis. Morbidity is substantial with 74% of patients reporting considerably compromised daily activities and 23% of patients unable to work Mortality rates vary based on different approaches to the treatment. In India, 10-year survival is reported to be 80% - 85% [8,9]. Patients can develop rapidly expanding aneurysms, suffer from pulmonary hypertension or aortic rupture. Cardiac complications are common, and aortic valve insufficiency, cardiac ischemia and myocardial infarction complicated by cardiac failure are frequent causes of death [10].

Reasons for poor outcome

The relatively poor outcome for patients with this disease is due to lack of awareness, heterogeneous presentation, and rarity of the disease itself. An inadequate approach to ischemic symptoms in children and young adults, and a failure to recognize the importance of diminished pulsation in the limbs during examination are also important contributing factors.

Differential diagnosis

The differential diagnoses include other causes of large vessel vasculitis:

1) Inflammatory aortitis (tuberculosis, rheumatoid arthritis, spondyloarthropathies, Kawasaki disease, and giant cell arteritis);
2) Developmental abnormalities (coarctation of the aorta and Marfan syndrome).

Most of these have specific features for diagnosis, but tuberculosis has remained an enigma. The incidence of rupture and bleeding complications of aneurysmal Takayasu arteritis is low. Syphilis tends to affect older age group, affecting the arch and ascending aorta. Hypertension due to fibromuscular dysplasia is to be kept as differentials.

Treatment

The aim of treatment must be the control of disease activity and the preservation of vascular competence, with minimal long-term side effects. Currently, as the best evidence base suggests, corticosteroids are the standard form of treatment, to which 50% respond, and Methotrexate is used as a steroid sparing drug. Only 25% of patients with active disease may not respond to current treatments and care should be taken to avoid prolonged immunosuppression in the absence of clinical benefit. Mycophenolate has also been used to control the inflammatory disease with good results. Most patients will receive immunosuppression and thereby achieve effective disease control and reduce the burden of surgery and complications.

Infliximab and Tocilizumab are cytokine inhibitors found to be useful in managing the activity of Takayasu. In the retrospective multicenter study of outcome of 49 TA patients, treated by TNF-α antagonists (80%) or tocilizumab (20%) and fulfilling ACR criteria, the overall response (i.e., complete and partial) to biological-targeted treatments at 6 and 12 months were of 75% and 83%, respectively. The 3-year relapse free survival was of 90.9% over biologic treatment period compared to 58.7% with DMARDs [10,11].

Surgical treatment

Indications for surgery include hypertension with critical renal artery stenosis, extremity claudication, cerebrovascular ischemia or critical stenosis of three or more cerebral vessels, moderate aortic regurgitation, and cardiac ischemia with confirmed coronary artery involvement. In general, surgery is recommended at a time of quiescent disease to avoid complications, which include restenosis, anastamotic failure, hemorrhage, and infection.

Follow up

Takayasu arteritis is a systemic vasculopathy that can progress to cause vital organ ischemia. Hence, long-term follow-up is recommended. Magnetic resonance angiography (MRA) is now being used in the evaluation of large vessel vasculitides [12,13], It provides high resolution images of vessel wall thickness and lumen configuration, and allows the measurement of wall enhancement as a reflection of active inflammation. The reduction of enhancement on follow up is presumed to reflect reduced inflammatory activity. Therefore, MRA is likely to be used increasingly as an accurate follow up tool [14]. There is still lot of uncertainty with regard to the disease onset and course, and one fourth of patients may end up having progressive disease.

Outcome and implications for the case presented

This girl has now been diagnosed prior to any organ specific complications and on regular treatment with follow-up. When she plans to get pregnant, there will be some implications regarding methotrexate. Obviously, the disease will have to be controlled with safer medications.

DISCUSSION AND CONCLUSION

Although asymptomatic presentation of Takayasu vasculitis in not uncommon, presenting with psychoses or association with psychotic manifestation is unusual. We believe the diagnosis found after electroconvulsive therapy was coincidental. As there were no cerebral structural symptoms or an organic sign, MR angiography was not pursued. Takayasu arteritis should be considered in women with fever, fatigue, hypertension, and absence of pulse or low volume pulse. Early diagnosis and initiation of adequate treatment is important to prevent further progression and complications like aortic regurgitations and cerebro-vascular accidents.

Key messages

- Absent pulses in young patient should alert to possible large vessel vasculitis.
- Asymptomatic Takayasu disease is not uncommon.
- Takayasu vasculitis is entirely treatable with current newer treatment approaches.

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Kimura's Disease in the West-Case Report and Review of Literature

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Abstract: We report a 58 yr old lady, who had right temple swelling for 2 years, which on excision biopsy showed features of vasculitis. During the Rheumatology review, Clinical evaluation didn't reveal any features suggestive of Giant cell arteritis and inflammatory markers were normal. She had localised granulomatous changes without giant cells and pathologist gave the opinion as Kimura's disease. It has been described in East Asia especially in Japan as Juvenile Giant cell vasculitis (also known as Kimura's disease (KD). It was reported by Kimura *et al*. as chronic inflammatory disorder of unknown aetiology with granulomatous changes mimicking vasculitis but no giant cells. It is very rare in Caucasians and early diagnosis will result in appropriate treatment and sparing the immunomodulatory treatment. This case is presented to increase awareness of KD and to highlight the features which may aid the diagnosis.

Keywords: Kimura, Lymphadenopathy, Eosinophilia, Vasculitis, Granuloma.

BACKGROUND

A referral to rheumatologist with a swelling on the temple generally implies Giant cell arteritis, but we report a case of a less well known disorder, Kimura Disease (KD). KD is a chronic inflammatory disorder of unknown aetiology which generally presents with a characteristic triad of symptoms and signs. These are a painless slowly enlarging soft tissue mass, associated lymphadenopathy and mostly peripheral eosinophilia.

CASE SUMMARY

A 58 year old Caucasian woman, completely well in the past was referred for removal of a slow growing swelling on her right temple for cosmetic reasons. She has had a 1 cm swelling on her right temple for almost 2 years. Ultrasound suggested an aneurysm of the anterior branch of the right temporal artery and she underwent excision of the swelling. The histological appearances were suggestive of vasculitis and she was referred urgently to rheumatology for an assessment.

On review of her symptoms, there was no pain or tenderness over the temporal arteries. She denied any history of jaw claudication, visual or PMR symptoms and there were no features to suggest systemic vasculitis. There was no palpable lymphadenopathy. She didn't have any bruit and systemic examination was unremarkable. She was a smoker and had high cholesterol. All her investigations were normal including full blood count (neutrophils, eosinophils, lymphocytes, platelets and haemoglobin all were normal), electrolytes, liver functions tests, inflammatory markers- CRP and plasma viscosity and antinuclear antibody. Immunoglobulin subclass study was normal. Urine didn't reveal any hematoproteinuria. Chest roentgenogram was normal too.

In view of the negative history and normal serology, the histology report was reviewed. The description was of a medium sized muscular artery with intimal fibroplasias, luminal constriction, neovascularisation and destruction of the internal elastic lamina. This was associated with a sprinkling of eosinophils, plasma cells, and chronic inflammatory cells. No giant cells were seen. The aetiology of the arteritis was uncertain, but similar changes have been described in so-called "juvenile temporal arteritis or *Kimura disease."* (KD).

DISCUSSION

It is important to be aware of the temporal artery vasculitis which is increasingly more common. This patient was entirely asymptomatic which prompted us to review the biopsy with the pathologists.

This case is presented to increase the awareness of KD and to highlight features which may aid the diagnosis of this condition. Prior to biopsy, diagnosis of Kimura's disease was not considered in our patient because of its rarity in the West. With its predilection for the head and neck region and its variability in presentation, it can frequently be mistaken for other

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conditions. A high index of suspicion is required and KD should be considered in the differential diagnosis of head and neck masses. In general, KD is rare in Caucasians and there is often peripheral eosinophilia and elevated serum IgE. Neither was present in our patient, but the measurements were done at the time of regression. Hence, the levels during active disease were unknown.

Kimura's disease is a chronic inflammatory disorder of unknown aetiology, first reported by Chinese authors Kimm and Szeto in 1937 [1, 2], but the definitive description was published by Kimura *et al.* in Japan in 1948. KD is most prevalent in Asians, uncommon in Caucasians and rare in Blacks. Eighty-five per cent of cases occur in men, with six times as many males being affected than females. KD typically affects patients in their second to third decades of life, with the median age of 28 years in one series. It is often accompanied by markedly elevated serum immunoglobulin E (IgE) levels [3, 4]. There is a high incidence of renal involvement, notably proteinuria and nephrotic syndrome [5]. Arthropathy, Asthma [6] and raynauds have also been reported [7]. There have been suggestions about infections triggering the disease, some form an unusual atopic response or toxins as the precipitating event [8]. Elevated levels of interleukin (IL)-5, IL-4 and IL-13 have been found in peripheral blood mononuclear cells and IL-5 in lymph nodes of affected patients. Histologically, the lesions are characterized by reactive lymphoid follicles with eosinophilic infiltration, sometimes forming eosinophilic abscesses [4, 9, 10, 11]. The main differential diagnosis is angiolymphoid hyperplasia with eosinophilia (ALHE), giant cell arteritis, panarteritis nodosa, Takayasu arteritis, and isolated vasculitis of the vasa vasorum.

The treatment of choice for localized disease is surgical excision [1], though conservative treatment in the form of intralesional steroid injection or the use of radiotherapy [12] in mostly anatomically sensitive areas such as the periorbital area [13] has been found to successful. In two cases, pranlukast, a leukotriene receptor antagonist, (450 mg/day) was reported to be effective treatment for KD, without any adverse side effects. Despite steroid discontinuation, this patient remained disease-free at follow-up 6 months later.

PRACTICAL MESSAGE

Early diagnosis of KD could spare the patient unnecessary and potentially harmful diagnostic procedures in addition to extensive therapy and anxiety.

KEY MESSAGE

Kimura‟s disease is a rare differential diagnosis to consider in evaluating giant cell arteritis.

It is one of the pulmonary-renal syndromes with raised Eosinophils and IgE levels.

DISCLOSURE STATEMENT

The Authors have declared no conflict of interest.

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Interleukin-6 blocker for successful outcome of late-onset rheumatoid oligoarthritis

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Abstract

Newer cytokine therapies have revolutionised the management of Rheumatoid arthritis. Atypical oligoarthritis can also be a manifestation of RA and CCP antibodies have been proven to be most specific for Rheumatoid. Our patient had 2 years of painful ankle bilaterally and suggested for joint replacement due to osteoarthritis changes. After the diagnosis of RA using Anti-CCP antibodies, we elected to give Tocilizumab(IL 6 Blocker) which had made the patient to walk without wheelchair after 2 years. This suggests early appropriate diagnosis is the key and Biologics- the new Kid in the market- has proven to be effective in early Rheumatoid arthritis.

Keywords: Tocilizumab, Oligoarthitis, IL-6 blocker, Anti-CCP antibodies, Rheumatoid arthritis

Introduction

Rheumatoid arthritis (RA) is a common systemic inflammatory disease affecting approximately 1% of the world population.(1) Interleukin 6 (IL-6) is a cytokine involved in the pathophysiology of RA, and its level in serum and synovial fluid correlates with the disease activity and joint destruction.(2) Tocilizumab is a humanized anti-human IL-6 receptor antibody, used in the treatment of RA. It blocks the IL6 membrane bound signalling and trans signalling thereby effectively blocking the interleukin 6.(3) Anti Citrullinated cyclic peptide antibodies are specific for Rheumatoid arthritis and only smoking can citrullinate the peptide. Early treatment during the "Window of opportunity" appears to reset the progression of the disease.(4) Tocilizumab has been approved for use in Rheumatoid arthritis since 2009.(5)

Case Report

A 68 year old female, presented with pain and swelling in the right ankle joint for two years and getting worse to the point of needing wheelchair assistance to mobilise. She denied any fever or trauma or weight loss. There was no other joint involvement or any features of rheumatoid. She had consulted 3 different surgeons who all suggested doing MRI ankle following which she was pencilled in for having ankle replacement but she declined. Medical history included hypertension and varicose veins of the legs.

Clinical examination revealed bilateral pitting pedal oedema in lower limbs at the ankle joints. The right ankle joint was swollen and tender with synovitis and left foot had oedema due to varicosity. Passive movement was restricted. She struggled to do her daily activities needing assistance from her husband.

Blood investigations	
ESR	67 mm
CRP	24
Anti-CCP	112 U/I

Other investigations showed normal blood count, renal and liver functions and normal ferritin.

MRI showed widespread synovitis with effusion in the ankle and mild cartilage destruction. There was neither marrow oedema nor tendon rupture. (Image 1)

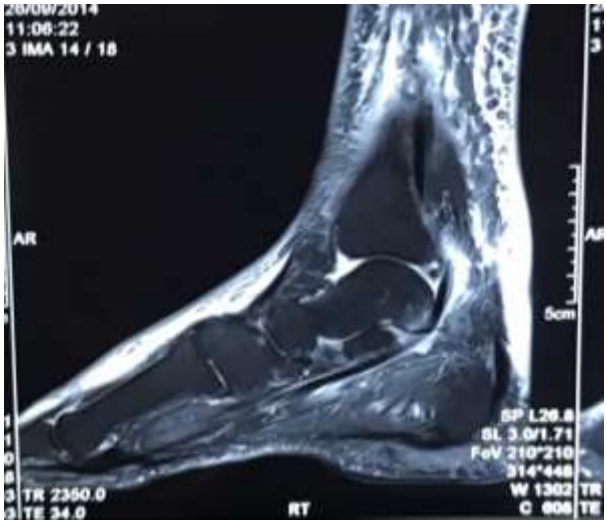

Image showing synovitis in the ankle joint

Diagnosis: She has had **CCP positive oligoarthritis** from the onset and now has worsened and infective pathology has been excluded. Following her significant response to corticosteroid injections, we counselled and prebiologic screening was done. She was given intravenous **Tocilizumab (Actemra) 8mg/kg (IL-6 blocker**). To her surprise she became pain free and was able to walk without support and very much delighted.

She continued the treatment every 4 weeks for 5 months and now she is on sulfasalazine and ambulant, not needed any analgesics.

Discussion

This patient had painful ankle and reduced movement and it's rare for a patient to have ankle arthritis with RA. Although she had degenerative changes, bilateral disease- symmetrical- would suggest systemic problem and hence CCP was done. The mode of action of Tocilizumab is blocking Interleukin-6, thereby reducing inflammation and disease activity. MRI is sensitive to pick up early changes due to RA and patient's concurrence to have it investigated and agreeing to expensive drug proved that newer cytokines do play a transformational role in the management of Rheumatoid arthritis.

Conclusion

Late onset oligoarthritis in elderly patient needs adequate evaluation and CCP antibody being positive with high CRP clinches the diagnosis of RA. Tocilizumab, an Interleukin-6 blocker has been proven to be efficacious in high CRP Rheumatoid. Newer biologics do play a significant role in immune-modulation and help to maintain good disease control thereby achieving better quality of life.

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ABSTRACT

Takayasu arteritis is one of the large vessel vasculitis with variable clinical features in Indian patients. It is common in males and may be associated with tuberculosis and often presents with large vessel wall inflammation, obstruction and aneurysm. A 23-year-old female presented with features of acute psychosis and during evaluation and following electroconvulsive therapy she was found to be tachycardic and pulse less in one arm. Further CT angiogram proved features of aortoarteritis with raised inflammatory markers and her infective screen including TB came back as negative. She was treated with steroids, losartan and corticosteroids and Methotrexate was added as steroid sparing immune suppression. She remains disease free and doing well. Literature review suggests increasing incidence of this vasculitis and early effective treatment helps to reduce morbidity and prolong disease free remission.

Keywords: Takayasu vasculitis, Occluded carotid, Depression

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CASE PRESENTATION

A 23-year-old female presented with two weeks history of talking to self, agitated and insomnia and found wandering on the streets. There was no history of fever, headache, or trauma. She was in acute psychosis. She was married and was in a difficult relationship. She was treated with oral antipsychotics. Her basic blood investigations were normal except ESR of 38 mm/hr. As she did not respond to the treatment she was given electroconvulsive therapy (ECT) and following ECT she was found to have tachycardia which settled afterwards. ECG following ECT showed T inversion in inferior leads.

Following cardiology review, she was found to have carotid and subclavian bruit and her CT angiogram showed occluded left common carotid and left subclavian artery, stenosed celiac axis bulb and diffusely thickened aorta. Echo showed good left ventricular function. Her immunology all came back normal. Quantiferon test for TB was

negative. Her chest imaging was normal. The diagnosis was Large vessel vasculitis-Takayasu arteritis pattern with schizophrenia. She was commenced on immunosuppression.

This is a unique presentation and although it was chance association, asymptomatic vasculitis presenting as an acute psychosis is unexplained.

CLINICAL FEATURES

The disease commonly presents in late 20s often with a long delay in diagnosis. The National Institute of Health study by Kerr, et al. suggested that the delay in diagnosis was longer in juveniles, being up to four times that of adult patients [3]. Hypertension was the commonest mode of presentation (51.3%) and was detected in 82 patients (77.4%) at the time of presentation in a study by Jain, et al. Systemic features include fever, night sweats, malaise, weight loss, arthralgia, and anemia [4]. As the inflammation progresses and vessel gets occluded, more characteristic features appear with the development of collaterals.

The most commonly affected vessels are the subclavian and common carotid arteries. Stenotic lesions are found in >90% of patients, whereas aneurysms are reported in approximately 25%. Pulmonary arteries are involved in up to 50% of patients and it is important to look specifically for evidence of aortic valve regurgitation and coronary arteritis [5]. In Indian patients, vasculitis generally occurs in the abdominal aorta affecting renal arteries and may extend into the thoracic aorta within a decade [2].

Takayasu arteritis can be divided into the following six types based on angiographic involvement based on Angiography [5]:

- **Type I** - Branches of the aortic arch
- **Type IIa** - Ascending aorta, aortic arch, and its branches
- **Type IIb** - Type IIa region plus thoracic descending aorta
- **Type III -** Thoracic descending aorta, abdominal aorta, renal arteries, or a combination
- **Type IV** - Abdominal aorta, renal arteries, or both
- **Type V** - Entire aorta and its branches

Etiology/Demographics

Although the definite etiology is unknown, the major pathology is inflammatory, with several proposed factors including spirochetes, mycobacterium tuberculosis, and streptococcal organisms and circulating antibodies due to an autoimmune process. Although Mycobacterium tuberculosis has been implicated in the pathogenesis of Takayasu's arteritis (TA), there is no direct evidence substantiating the association [6].

Takayasu arteritis is observed more frequently in patients of East Asian or Indian descent. Approximately 80% of patients with Takayasu arteritis are women [7]. Takayasu arteritis is progressive or relapsing/remitting and requires immunosuppressive treatment for disease remission and maintenance.

Prognosis

The complications of Takayasu arteritis can be severe and although medical and cardiothoracic interventions have improved, still lot more to be done to improve the prognosis. Morbidity is substantial with 74% of patients reporting considerably compromised daily activities and 23% of patients unable to work Mortality rates vary based on different approaches to the treatment. In India, 10-year survival is reported to be 80% - 85% [8,9]. Patients can develop rapidly expanding aneurysms, suffer from pulmonary hypertension or aortic rupture. Cardiac complications are common, and aortic valve insufficiency, cardiac ischemia and myocardial infarction complicated by cardiac failure are frequent causes of death [10].

Reasons for poor outcome

The relatively poor outcome for patients with this disease is due to lack of awareness, heterogeneous presentation, and rarity of the disease itself. An inadequate approach to ischemic symptoms in children and young adults, and a failure to recognize the importance of diminished pulsation in the limbs during examination are also important contributing factors.

Differential diagnosis

The differential diagnoses include other causes of large vessel vasculitis:

1) Inflammatory aortitis (tuberculosis, rheumatoid arthritis, spondyloarthropathies, Kawasaki disease, and giant cell arteritis);
2) Developmental abnormalities (coarctation of the aorta and Marfan syndrome).

Most of these have specific features for diagnosis, but tuberculosis has remained an enigma. The incidence of rupture and bleeding complications of aneurysmal Takayasu arteritis is low. Syphilis tends to affect older age group, affecting the arch and ascending aorta. Hypertension due to fibromuscular dysplasia is to be kept as differentials.

Treatment

The aim of treatment must be the control of disease activity and the preservation of vascular competence, with minimal long-term side effects. Currently, as the best evidence base suggests, corticosteroids are the standard form of treatment, to which 50% respond, and Methotrexate is used as a steroid sparing drug. Only 25% of patients with active disease may not respond to current treatments and care should be taken to avoid prolonged immunosuppression in the absence of clinical benefit. Mycophenolate has also been used to control the inflammatory disease with good results. Most patients will receive immunosuppression and thereby achieve effective disease control and reduce the burden of surgery and complications.

Infliximab and Tocilizumab are cytokine inhibitors found to be useful in managing the activity of Takayasu. In the retrospective multicenter study of outcome of 49 TA patients, treated by TNF-α antagonists (80%) or tocilizumab (20%) and fulfilling ACR criteria, the overall response (i.e., complete and partial) to biological-targeted treatments at 6 and 12 months were of 75% and 83%, respectively. The 3-year relapse free survival was of 90.9% over biologic treatment period compared to 58.7% with DMARDs [10,11].

Surgical treatment

Indications for surgery include hypertension with critical renal artery stenosis, extremity claudication, cerebrovascular ischemia or critical stenosis of three or more cerebral vessels, moderate aortic regurgitation, and cardiac ischemia with confirmed coronary artery involvement. In general, surgery is recommended at a time of quiescent disease to avoid complications, which include restenosis, anastamotic failure, hemorrhage, and infection.

Follow up

Takayasu arteritis is a systemic vasculopathy that can progress to cause vital organ ischemia. Hence, long-term follow-up is recommended. Magnetic resonance angiography (MRA) is now being used in the evaluation of large vessel vasculitides [12,13], It provides high resolution images of vessel wall thickness and lumen configuration, and allows the measurement of wall enhancement as a reflection of active inflammation. The reduction of enhancement on follow up is presumed to reflect reduced inflammatory activity. Therefore, MRA is likely to be used increasingly as an accurate follow up tool [14]. There is still lot of uncertainty with regard to the disease onset and course, and one fourth of patients may end up having progressive disease.

Outcome and implications for the case presented

This girl has now been diagnosed prior to any organ specific complications and on regular treatment with follow-up. When she plans to get pregnant, there will be some implications regarding methotrexate. Obviously, the disease will have to be controlled with safer medications.

DISCUSSION AND CONCLUSION

Although asymptomatic presentation of Takayasu vasculitis in not uncommon, presenting with psychoses or association with psychotic manifestation is unusual. We believe the diagnosis found after electroconvulsive therapy was coincidental. As there were no cerebral structural symptoms or an organic sign, MR angiography was not pursued. Takayasu arteritis should be considered in women with fever, fatigue, hypertension, and absence of pulse or low volume pulse. Early diagnosis and initiation of adequate treatment is important to prevent further progression and complications like aortic regurgitations and cerebro-vascular accidents.

Key messages

- Absent pulses in young patient should alert to possible large vessel vasculitis.
- Asymptomatic Takayasu disease is not uncommon.
- Takayasu vasculitis is entirely treatable with current newer treatment approaches.

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Original Research Article

Clinical profile of urolithiasis among hospitalized children- a single center study

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Abstract

Introduction: Incidence of renal and bladder stones is increasing worldwide and many children presenting with pain abdomen are diagnosed to have renal calculi. There is high rate of recurrence of stones in children if full clearance is not achieved or metabolic evaluation is not performed. We analyzed the clinical profile of the children diagnosed to have Urolithiasis and admitted in pediatric ward of our institute over the period of 2 years (Jan 2015 to Dec 2016) **Methods:** We conducted an Observational study done in Children <15 years diagnosed to have Urolithiasis based on Ultrasound findings and admitted in pediatric ward of Velammal medical college hospital, Madurai, Tamilnadu between January 2015 to December 2016. A total of 30 children were enrolled in this study and their demographic details, clinical presentation, investigations and management were analyzed. **Results:** Pediatric urolithiasis was more common in boys (75%) with colicky pain abdomen (90%) as the predominant presenting symptom. Most of the children presented during the summer months. They had associated complications like urinary tract infection, hydronephrosis and Pelviureteric junction obstruction. Ureter was the commonest site of urolithiasis (18/30) and most of the children responded to medical management. The children who presented with recurrent symptoms during this study period were evaluated and diagnosed to have some underlying metabolic or genetic disorder. **Conclusion:** Rising incidence of renal stones with acute colicky pain in pediatric age group is a worrisome problem as it causes school absenteeism and mental stress to the entire family. Urolithiasis in children needs complete evaluation to rule out underlying metabolic disorder. Complete evaluation of the underlying etiology is essential to prevent recurrence and further complications.

Keywords: Kidney calculi, Urinary bladder calculi, Obesity

Introduction

Incidence of renal and bladder stones is increasing worldwide and especially many children presenting with pain abdomen are diagnosed to have renal calculi (1,2). The changing dietary habits and increasing prevalence of obesity is a major risk factor in children. Two important risk factors for stone formation in children are not drinking enough fluids and eating too much salt; both increase the amount of calcium and oxalate in the urine. There is high rate of recurrence of stones in children if full clearance is not achieved or metabolic evaluation is not performed and managed (3,4). There is significant change in the clinical profile of pediatric urolithiasis in developing nations. Bladder stones have become rare (5) and many asymptomatic obese children (6) are diagnosed to have renal calculi as a part of the metabolic syndrome. The widespread availability of Ultrasound is also an important reason for increasing diagnosis of urolithiasis. We analyzed the clinical profile of the children diagnosed to have Urolithiasis and admitted in pediatric ward of our institute over the period of 2 years (Jan 2015 to Dec 2016)

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Materials and Methods

Objective of the study: To study the clinical manifestations, management and outcome of all children diagnosed as urolithiasis and analyze the factors associated with recurrent episodes of renal stone formation.

Place and duration of study: Velammal medical college hospital, Madurai, Tamilnadu, January 2015 to December 2016

Study design: Observational study

Study population: Children <15 years diagnosed to have Urolithiasis based on Ultrasound findings

The study was conducted after getting ethical committee clearance from the institute. Data collection was done by reviewing the case sheets from medical records department and contacting the patient over phone to collect additional details. Data was entered in Microsoft excel and analysis was done.

Results

Out of the 30 cases, almost three fourth of the cases were boys. About 23 out of the total 30 children (77%) were boys, showing a significant male predominance (Fig 1), the sex predilection more evident after 6 years of age. 5 of them had a positive family history of renal calculi.3 of them had recurrent renal calculi requiring multiple hospitalizations and repeated surgical intervention. 6 children were less than 5 years of age, 13 children were between 6 to 10 years while 11 of them were between 11 to 15 years.

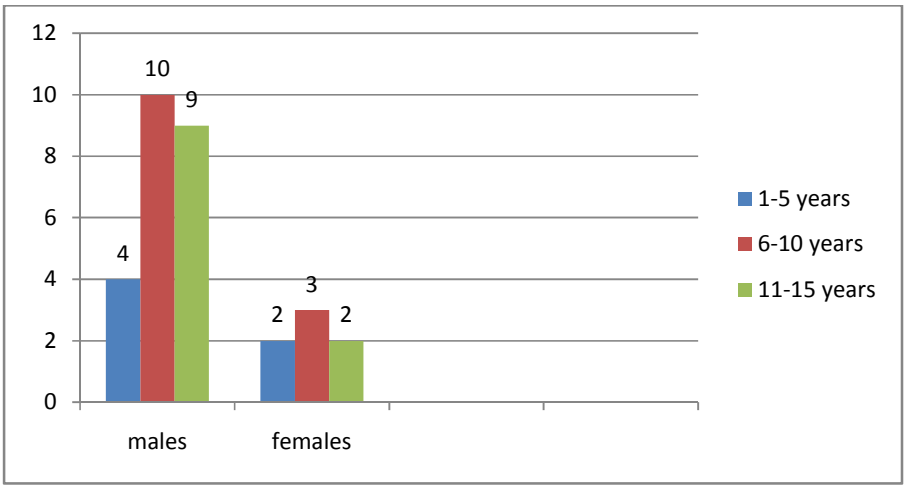

Figure-1: Pediatric Urolithiasis: age distribution.

Almost 90% of them had pain abdomen as the predominant symptom which was colicky and radiating. Around 53% had associated vomiting, while 33% had associated urinary tract infection like symptoms (10/30) (Table 1). History of similar illness in the past was present in nine children. Few children (3/30) presented with anuria while in ultrasound 8 had features of hydronephrosis secondary to obstruction commonly in the pelviureteric junction

Table-1: Pediatric Urolithiasis: Symptomatology.

Symptoms	No. of children	Percentage
Pain abdomen	27/30	90%
Vomiting	16/30	53%
Oligoanuria	3/ 30	10%
Hematuria	3/30	10%
UTI like illness	10/30	33%
Previous similar episodes	9/30	30%
Positive family history	5/30	16.6%

The maximum number of children presenting with a renal colic due to calculi was in summer months (May, June) and mild increase in cases during October, November, December which is predominantly rainy in this part of the country (Fig 2).

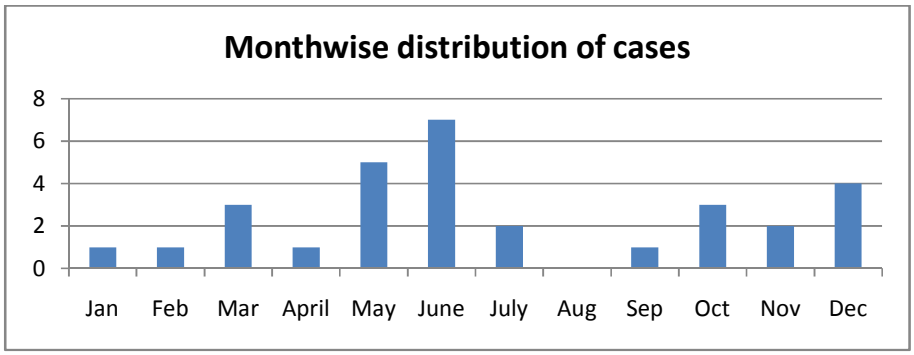

Figure-2: Pediatric urolithiasis- Month wise Case distribution

The diagnosis of urolithiasis was made based upon Ultrasound findings- to identify the site and size of calculi. 18 children had ureteric calculi (Fig 3) which was the commonest and symptomatic, of which 5 had associated renal calculi. On further analysis among the different age groups, the most common site of renal calculi was in the ureter. Out of the 11 children in the 11 to 15 year age group, 8 of them had ureteric calculi while 2 of them had both renal and ureteric calculi and 1 had both renal and vesical calculus. Out of the 13 children in 6 to 10 age group, 7 had ureteric and 6 had renal calculi. Only 6 children were in the 1 to 5 age group, with 3 ureteric and 2 renal calculi. Bladder calculi were present in 4 children more than 5years of age.

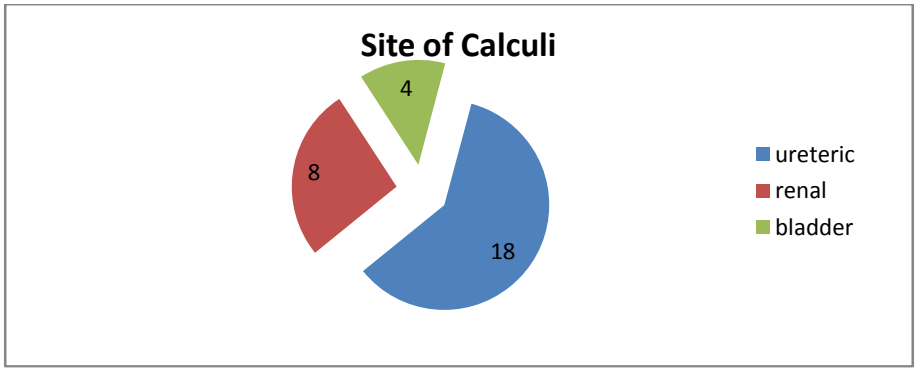

Figure-3: Pediatric Urolithiasis- Site of Calculi.

Out of the total 30 children enrolled in the study, 18 children had spontaneous passage of the calculi with conservative medical management while 12 of them required surgery. Most of the children (14/18) had symptomatic relief with analgesics and hydration. They had spontaneous passage of the renal stones within 48-72 hours. They were discharged within 5 days. Few children (4/18) required oral tamsulosin for 3 days.

Evidence of associated urinary tract infection in the form of pyuria, bacteriuria and trace proteinuria were present in 17 out of the 30 children and 3 of them had culture positivity- significant colonies of E. coli(2/3) and proteus (1/3) had grown in urine culture. Hence they were treated for the same. Others who were symptomatic but negative cultures were given empiric oral antibiotics.

Some children presented with associated complications of calculi like Hydroureteronephrosis (6/10) and pelviureteric junction obstruction (4/ 10). One child had pyonephrosis with E.coli grown in culture requiring i.v antibiotics followed by percutaneous nephrolithotomy. Spontaneous passage of stone was observed in 4 children with hydroureteronephrosis with medical management. Repeat ultrasound done after 5 days showed normal kidneys and ureters. 2 children required surgical intervention. The need for surgical intervention was more in the younger age groups. Between 1-5 years, 4 out of 6 required surgery while among children between 11 to 15 years only 4 out of 11 required surgical intervention. The most common surgical intervention done was percutaneous nephrolithotomy (6/12), 2 children were treated with extracorporeal shockwave lithotripsy and stenting. Out of the 4 children with bladder stones, 3 were treated with open cystolithotomy while one was treated cystoscopically.

Discussion

Urolithiasis in the pediatric population is an important cause of morbidity worldwide [1,2,3,4]. Presenting signs and symptoms are often considerably different from those in adults. Kidney stone is not a disease itself, but it is only a symptom. Therefore, its early diagnosis is mandatory for every child with the first stone event. Vague abdominal pain, hematuria, and urinary tract infection are more common in children than the classic colicky flank pain [1]. It has become more common in children over the past few decades as a result of rapid variations in food habits and increasing affluence.

Changing socio-economic conditions have generated changes in the incidence and type of urolithiasis in terms of both the site and the physico-chemical composition of the calculi. Up to 50% of the children may have underlying abnormalities leading to formation of kidney stones such as high calcium in urine, low citrate in urine, high uric acid or oxalates in urine [2]. A study published in 1991 from Western India over duration of 9 years had a total of 77 children with 6.4% incidence in children from the overall total urolithiasis cases [5]. This shows a significant increase in the prevalence of urolithiasis in children over the last twenty years.

Childhood obesity [6] is also a risk factor for stone formation. Children today seem to live a lifestyle that puts them at risk of kidney stones, meaning they consume sugar-filled drinks and a fast-food diet that is high in sodium, a known risk factor in the formation of kidney stones. Extensive epidemiological observations have emphasized the importance of nutritional factors in the pathogenesis of urolithiasis, and specific dietary advice is, nowadays, often the most appropriate for prevention and treatment of urolithiasis. A familial occurrence has also been suggested for hypercalciuria, one of the main risk factors for idiopathic urolithiasis.

There are few important epidemiologic variations in Urolithiasis presentation between developed and developing countries. In our study, there was a significant male predominance, which was similar to other Asian studies [7,8] with 2:1 to 3:1 ratio. But some studies in children [5] did not find significant male predominance in children than in adults. Also the most common site of calculi is in ureter or renal pelvis. A report from Pakistan demonstrated a shift in the predominant location of urinary calculi from the bladder to the upper urinary tract over a 13-year period from 1987 to 2000 [9]. In some older studies from India also [5], urinary bladder calculi (67.5%) were more common than upper urinary tract but currently the scenario is changing and getting similar to the developed nations.

The seasonal increases in cases were noticed during summer months which could have been due to dehydration coupled with decreased fluid intake. UTI is also another common presenting sign of urolithiasis in children. In a study around 54% of children referred with UTI had calculi [5]. Urinary tract infection is an important disease, which can highlight the presence of renal stone diseases. In this respect, clinicians should take a precise history regarding urinary tract infection and ask for urine analysis and urine culture.

In the adolescent boys, 3 out of the 9 were obese with body mass index more than 22. In the other age groups we did not find any significant metabolic syndrome associated with obesity and renal stones in this study. In those who presented with recurrent urolithiasis, hypercalciuria was noticed in 2 children, others had normal 24 hour calcium creatinine ratio. Stone analysis was done in 8 of them, with most of them turning out to be calcium oxalate [9, 11], one struvite stone and one rare case of silica stone [10] was also identified. Silicate stones are extremely rare type of urolithiasis, with incidence of 0.2% in humans. It is usually associated with consumption of a large amount of silicate containing antacids such as magnesium trisilicate. Other risk factors for silicate stone are malnutrition, infection, diet poor in proteins, drugs such as zonisamide (antiepileptic). In a sub-saharan study [11], Stone composition in urolithiasis in children was a heterogeneous disorder, with hyperuricosuria, insufficient diuresis, and infection due to malnutrition seems to be the common causes. There has been a change in the pattern of stone composition with an increase in the frequency of kidney stones and a decrease in bladder stones.

The role of familial predisposition and environmental factors in pediatric urolithiasis is now better understood. Metabolic factors are more common in pediatric urolithiasis than in adult stone disease [3, 12]. One 10 year old boy who presented with recurrent renal calculi and short stature along with cataract in both eyes was diagnosed as Dent's disease. He required surgical interventions in the form of percutaneous nephrolithotomy due to recurrent renal stones in both

kidneys which were more than 8 mm in size. A three year old who presented with renal stones, gall stones and hepatomegaly was diagnosed to have glycogen storage disease type 1. One adolescent boy who presented with ureteric calculi was a known Type 1 Diabetes mellitus on regular insulin therapy. There is increased risk of underlying metabolic or genetic disorders in children presenting at a very young age or with associated other manifestations.

An European retrospective study [13] between 2009 and 2013 of 68 children (34 boys and 34 girls) under 3 years revealed risk factors like metabolic disorders (up to 80%), infections of the urinary tract (46%), urinary system malformations (10-20%). Among the metabolic disorders, the most common are hypercalciuria (34%), hyperuricosuria (8%), cystinuria (7%) were identified in many studies [14-16]. Dietary management gives significant results if the underlying metabolic cause is identified [18]. In recent publications, it is recommended to begin the treatment with the high daily fluid intake and dietary alterations consistent with the metabolic disorders, a low-sodium diet for hypercalciuria, and oligopurine diet for hyperoxaluria. But there are no similar large scale Indian studies for complete evaluation of underlying metabolic or biochemical abnormality.

The recurrence rate of nephrolithiasis in patients with kidney stones that are developed during childhood is poorly defined [3,4]. Within ten years, this disease usually recurs in more than 50% of patient. Metabolic factors are determined by the assessment of urinary solutes and naturally occurring inhibitors of crystal and stone formation such as citrate. Lack of widespread availability of urinalysis to identify hypocitraturia or hyperuricosuria in our setting was an important setback.

Urine Analysis should be deferred until UTI has been treated completely and at least four weeks after lithotripsy or resolution of the obstruction. The normal values for the excretion rates of solutes are affected by regional and cultural variability.

Many children and adolescents with stones have more than one predisposing factor. When an inherited metabolic disorder is suspected, urine samples from family members can be help to diagnosis. In patients with multiple stones at the onset, or those in whom there is active stone formation and no anatomical abnormalities have been determined, additional examinations can be helpful [19].

Most commonly used diagnostic modality in our study was Ultrasound, as in many other studies. Although ultrasound is less sensitive than CT, ultrasound is usually a good initial choice and the most suitable method for the detection of urolithiasis in children because of radiation absence, no requirement of anesthesia, providing detailed anatomic information, cost–benefit issues, wide availability, detection of hydronephrosis and other anatomical disorders of the urinary tract.

The success of this imaging method depends on the observer's skills [20]. Non-contrast spiral computed tomography (CT) scan is the gold standard for the diagnosis of nephrolithiasis, because it has an excellent visualization of all stones whether they are opaque or nonopaque. Except for indinavir stones, size and location of stones, it is rapid and nearly 100% sensitive and specific. CT scan provides detailed anatomic information and is sensitivity for very small stones. It is recommended to perform CT scan in children with refractory urolithiasis symptoms but without clear evidence of stone in KUB and ultrasonography [19].

Medical explosive therapy includes the drugs that expel ureteral stones by relaxing smooth muscle. Calcium channel and alpha-1 receptors blockers are the main prescribed drugs. In some guidelines, this therapy is not recommended, because of little data in pediatric age group. Some clinicians administer alpha blocker medications in children with distal ureteral stone. We tried tamsulosin in 3 children with ureterovesical junction stones which had good response in all 3 children. None of them required surgical intervention. But the dose and duration for pediatric cases has not been well proven by trials. Most of the children enrolled in this study were given only hydration- oral and intravenous, along with analgesics.

Percutaneous nephrolithotomy (PCNL) is a less invasive treatment compared with open surgery. Therefore, this technique is a useful alternative to open surgery in children. The indications of PCNL are similar in children and adults. PCNL is indicated in renal stones with a diameter more than 20 mm. Most pediatric urinary tract stones are removed by ESWL, ureteroscopy and PCNL and a low number of stones are removed by open surgery.

The indication of open surgery is the presence of large stones especially in small children and very obese children and those with malformation

Conclusion

Rising incidence of renal stones with acute colicky pain in pediatric age group is a worrisome problem as it causes school absenteeism and mental stress to the entire family.

Urolithiasis in children needs complete evaluation to rule out underlying metabolic disorder. Parents need to be counseled on proper dietary modifications in order to prevent recurrence and further morbidities.

Complete evaluation of the underlying etiology is essential to prevent recurrence and further complications. Long term follow up of this cohort for recurrence of calculi and epidemiologic associations will help to identify the unknown and unclear etiologies behind the increasing incidence of renal calculi in the present generation of Indian population.

Abbreviations

Percutaneous nephrolithotomy PCNL, Extracorporeal shockwave lithotripsy ESWL, Pelviureteric junction PUJ computed tomography CT, Urinary tract infection UTI.

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Original Research Article

Clinical profile of children presenting with acute abdomen in a tertiary care centre of South Tamilnadu: a retrospective observational study

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ABSTRACT

Background: Acute abdominal pain is a common presentation in both outpatient visits and emergency room. It can be organic or functional, medical or surgical. We did an observational study to evaluate the clinical profile of children presenting with acute abdominal pain <7 days duration and analyse the various medical and surgical causes for this clinical presentation.
Methods: Children <15 years presenting with acute onset pain abdomen <7 days with or without fever, vomiting, loose stools or urinary symptoms and admitted in pediatric ward were included in the study. Out of the 205 children enrolled in the study, 120 were males and 85 were females.
Results: Only 15.6% of cases were of surgical etiology requiring elective or emergency surgical interventions. Among the 173 children diagnosed with variety of medical conditions, the most common condition presenting with pain abdomen was acid peptic disease (16%) followed by acute gastro enteritis(14%) and Urolithiasis(13%). Increasing prevalence of acute pancreatitis and type 1 diabetes mellitus (13 cases each) in children were observed.
Conclusions: Long term follow up of children presenting with mesenteric adenopathy without other significant pathology is warranted to avoid unnecessary empirical antituberculous treatment. Our study helped us to identify the different spectrum of etiologies across the three age groups (1-5 years, 6-10 years, 11-15 years) and some diseases were showing male or female predilection.

Keywords: Acute abdomen, Children

INTRODUCTION

Acute abdominal pain is a common cause of outpatient visits in any pediatric setting.[1] Some diseases require urgent surgical intervention while some may be of functional origin. A complete evaluation is the key factor approaching the disease and should include the patient's age, any trauma history, the onset and chronicity of the pain, the related symptoms and a detailed physical examination. The difficulty for a pediatrician begins when the history is not clear from the parents and if the child does not allow examining due to anxiety or pain. To identify the red flag signs indicating surgical emergency is of utmost importance. It can be the only manifestation of an underlying systemic illness like type 1 diabetes mellitus, porphyria etc. But many common medical conditions also present predominantly with pain abdomen as well. This study was conducted to analyses the common medical and surgical etiologies of acute abdominal pain in children.

METHODS

The objective of this study was to evaluate the clinical profile of children presenting with acute abdominal pain <7 days duration and analyse the various medical and

surgical causes for this clinical presentation. It was a retrospective observational study conducted in a tertiary care centre of South Tamilnadu (Velammal Medical College Hospital, Madurai, Tamilnadu).

Children (1 to15 years of age) presenting with acute onset pain abdomen <7 days with or without fever, vomiting, loose stools or urinary symptoms and admitted to the pediatric ward were included in the study. The diagnosis was made based on the clinical, biochemical and radiologic findings. Infants (<1 year) and children presenting with traumatic abdominal injury were excluded from the study.

Definitions used in this study

- *Acute appendicitis*: acute onset pain abdomen, with or without vomiting with right iliac fossa tenderness and confirmed by radiology (ultrasound or CT abdomen)
- *Abdominal tuberculosis*: Clinical features of fever, weight loss, altered bowel habit, abdominal pain and distension, positive contact history with AFB isolation or other suggestive picture in ascitic fluid analysis, caseating granuloma in biopsy specimen or suggestive colonoscopic/ radiological findings
- *Acid peptic disease*: Pain abdomen, vomiting with normal ultrasound and clinical response to proton pump inhibitors or diagnosis confirmed by upper gastrointestinal endoscopy
- *Acute pancreatitis*: pain abdomen with or without vomiting, with elevated amylase and lipase and suggestive radiologic findings in CT abdomen
- *Acute gastroenteritis*: Pain abdomen with loose stools and vomiting, without blood or mucus in stools, with or without fever
- *Colitis*: Pain abdomen with tenesmus, small volume loose stools with mucus or blood
- *Acute hepatitis*: pain abdomen with vomiting, with or without fever/ jaundice associated with raised liver enzymes
- *Cholelithiasis*: Pain abdomen with or without vomiting, with no other pathology but for radiologic evidence of gall stones
- *Dengue fever*: Confirmed by NS1 antigen or IgM antibody
- *Diabetic ketoacidosis*: Sick child with pain abdomen and fast breathing, Blood glucose>200 mg%. pH<7.3 and ketonuria
- *Mesenteric adenopathy*: pain abdomen with no other significant clinical, biochemical or radiologic finding but for at least three lymph nodes in ultrasonography with the peroneal diameter of 5 mm or more
- *Urinary tract infection*: Pain abdomen with frequent micturition or dysuria with evidence of pyuria/ bacteriuria or urine culture showing significant bacterial colonies or radiologic evidence of cystitis.
- *Urolithiasis*: Pain abdomen with radiologic evidence of renal or ureteric calculi.

The study was conducted after getting ethical committee clearance from the institute. Data collection was done by reviewing the case sheets from medical records department and contacting the patient over phone to collect additional details. Data was entered in Microsoft excel and analysis was done.

RESULTS

Out of the 205 children enrolled in the study, 120 were males and 85 were females (Figure 1). Only 15.6% of cases were of surgical etiology requiring elective or emergency surgical interventions (Figure 2). The commonest surgical cause for pain abdomen was appendicitis, out of the 19 cases 13 of them were in the adolescent age group with male predominance. The other surgical causes for acute abdomen were cholelithiasis, ileal perforation and torsion testis. A 13 year old child who presented with pain abdomen was diagnosed to have trichobezoar through upper GI endoscopy. She required surgery as the hair ball was only partially removable by endoscopy.

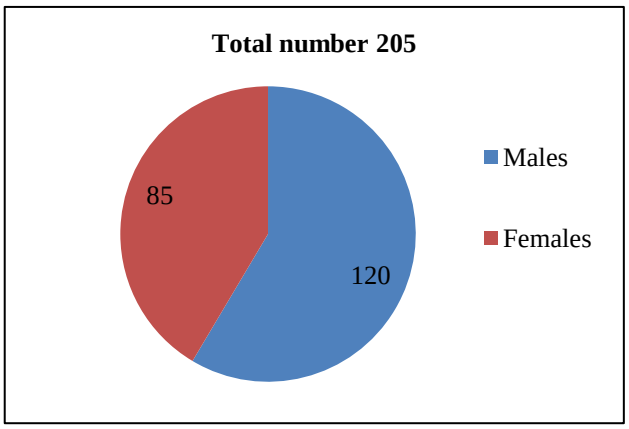

Figure 1: Percentage of boy's acute abdomen girls presenting with acute abdomen.

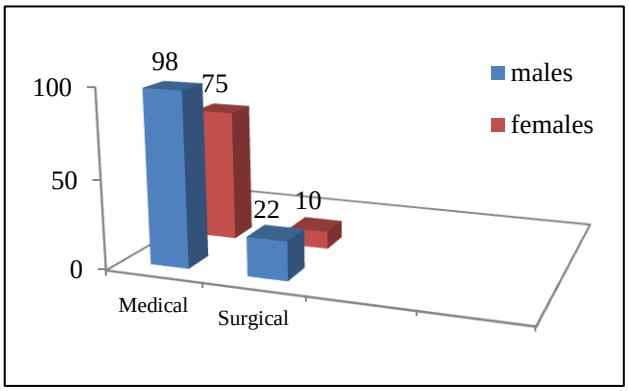

Figure 2: Percentage of medical and surgical cases in children 1-15 years.

Among the 173 children diagnosed with variety of medical conditions (Figure 3), the most common condition presenting with pain abdomen was acid peptic disease (16%) followed by acute gastro enteritis(14%) and Urolithiasis(13%). Children < 5 years (Figure 4) predominantly presented with pain abdomen, vomiting and loose stools and they were diagnosed to have acute gastroenteritis (17) clinically. The other common causes of pain abdomen in 1-5 years (Figure 4) were urinary tract infection (13), Dengue fever (5) and urolithiasis (5). In 6-10 years age group(Figure 5), the common diagnoses were dengue (10), urolithiasis (10), appendicitis (8), acid peptic disease (8) and mesenteric adenopathy (7) while in 11-15 years (Figure 6) acid peptic disease (18), appendicitis (11), acute pancreatitis (9) and urolithiasis (8) were common. The commonest cause for pain abdomen in boys was renal stones while in girls acid peptic disease was more prevalent.

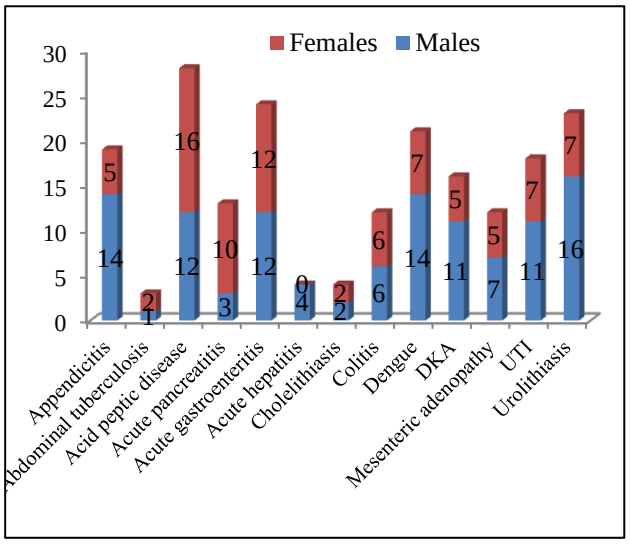

Figure 3: Common etiologies of acute abdomen in children 1-15 years of age.

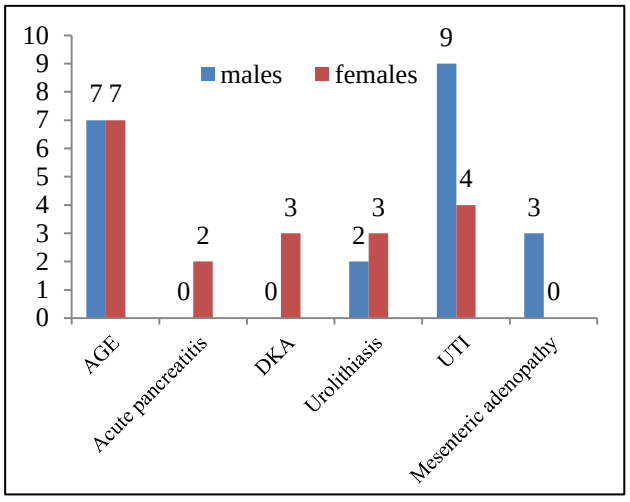

Figure 4: Clinical profile: 1 to 5 years, 59 children (35 males, 24 females).

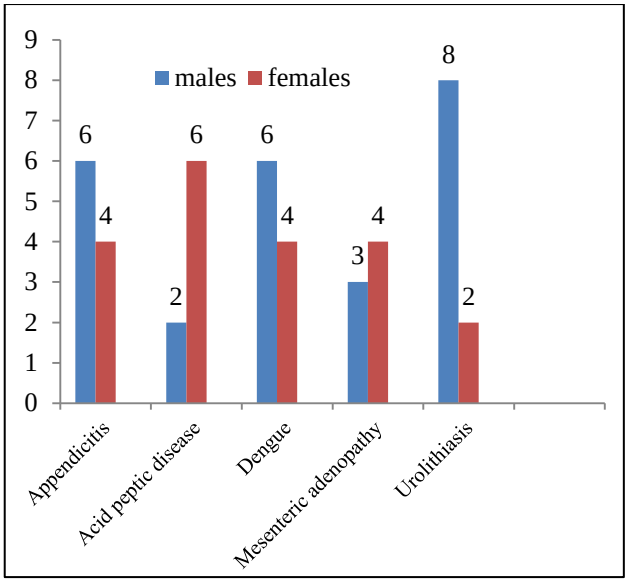

Figure 5: Clinical profile 6 to 10 years, 62 children (35 males, 27 females).

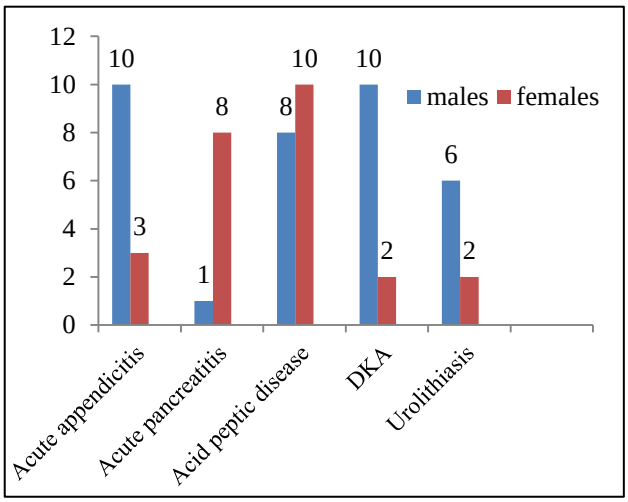

Figure 6: Clinical profile 11 to 15 years, 84 children (50 males, 34 females).

Increasing prevalence of acute pancreatitis (13 cases) in children was observed, which was mostly idiopathic in etiology and more in girls (10 out of 13). One case of pancreatic divisum was identified. Pain abdomen was the chief complaint in most of the newly diagnosed type 1 diabetes mellitus who presented as diabetic ketoacidosis. It had significant male predominance (11out of 16). Few children (12, 7 males) had pain abdomen as the sole complaint with no significant clinical findings but for mesenteric adenopathy (>1 cm) in Ultrasound.

DISCUSSION

Abdominal pain in children varies with age, associated symptoms, and pain location. It can be acute, recurrent or chronic in nature, based on the duration of symptoms. Although acute abdominal pain is usually benign and

self-limiting, there are uncommon but life-threatening conditions that require urgent care.[1] The most common non-surgical condition worldwide is gastroenteritis, while the most common surgical condition is appendicitis. Unlike the classic symptoms seen in adults, young children can display only lethargy or poor feeding in cases of appendicitis or can appear happy and playful between paroxysmal bouts of intussusceptions.[2]

Children >5 years can present with recurrent pain abdomen which may be purely functional. Mesenteric adenopathy in children is a common sonographic finding. In a developing country like ours, where tuberculosis is endemic, even insignificant adenopathy is treated with antituberculous drugs without proper evaluation while few cases with right iliac fossa are misdiagnosed as appendicitis and they undergo unnecessary surgery. In one series of 70 children with clinically suspected acute appendicitis, 16% had a final diagnosis of mesenteric lymphadenitis established by ultrasound, clinical course, or surgery.[3] Both medical and surgical causes can present with acute abdominal pain. The frequency of surgical intervention in patients presenting with acute abdominal pain varies from 1% to 20%, but the possibility of overlooking a serious organic etiology is a major concern for physicians.[4,5] Medical causes for acute abdomen can be abdominal or extra-abdominal inflammatory disorders which require proper evaluation and the right treatment.

The increased incidence of dengue fever in this locality was noted as it is an epidemic during the rainy season. Dengue fever with warning signs was predominantly presenting with pain abdomen and vomiting during the defervescence period. In a study published from Puducherry, 75% of patients of dengue fever with warning signs presented with vomiting and 35% with pain abdomen.[7]

The percentage of surgical cases in our study is significantly higher with increasing diagnosis of appendicitis, cholelithiasis and urolithiasis being made by radiology. A Turkish study showed increasing incidence of surgical causes of acute abdomen (20.7%).[4] The five most prevalent medical diagnoses were:

- Upper respiratory tract infection and/or complicated with otitis media or sinusitis (23.7%)
- Abdominal pain with uncertain etiology (15.4%)
- Gastroenteritis (15.4%)
- Constipation (9.4%); and
- Urinary tract infection (8%).

Among the medical conditions, rare diseases like type 1 diabetes and acute pancreatitis were increasingly identified. The increasing prevalence of T1DM in children, especially adolescents is recognized in the developed countries.[6] But no similar data is available in our country.

The increased incidence of acid peptic diseases in children was confirmed by upper GI endoscopy, of which 4 children were positive for helicobacter pylori infection. This can be attributed to the changing food habits and westernization in our country or due to increased diagnosis by endoscopy.A retrospective Japanese study published in 2004 concluded that *H. pylori* was significantly linked to duodenal ulcer and gastric ulcers in the age group of 10-16 years, but not in the age group of 9 years and under.[9]

A 14 year boy with severe malnutrition who presented with acute abdomen, loose stools and right iliac fossa tenderness was diagnosed as Crohn's disease based on CT enterography and colonoscopy. He had been treated as abdominal tuberculosis in the past with multiple courses of anti-tuberculosis drugs.

Only 2 confirmed cases of abdominal tuberculosis were diagnosed in children in our study. Diagnosis of abdominal tuberculosis is a diagnostic dilemma as there is difficulty in isolating the acid fast bacilli. Neither clinical signs, laboratory, radiological and endoscopic methods nor bacteriological and histopathological findings provide a gold standard in the diagnosis of abdominal TB.[8] Mesenteric adenopathy is another clue for abdominal Kochs. The causes of mesenteric adenitis have been reported to be viral, bacterial and mycobacterial infections.[10] Numerous bacteria have been demonstrated to be involved in mesenteric nodes: B. coli, staphylococci, streptococci, pneumococci, typhoid, paratyphoid and tubercle bacilli. In a Polish study performed on 127 children, Pain abdomen was the sole complaint (49.6%) in most of the children with mesenteric adenopathy.[11] Mesenteric adenitis is usually a self-limiting clinical condition characterized by fever, nausea, vomiting, diarrhea, diffuse or right lower quadrant abdominal pain and tenderness, and frequent leukocytosis. In our study, 12 children had only significant mesenteric adenopathy with negative Koch's workup and CT imaging, colonoscopy were normal. Their pain settled with antibiotics and supportive care. Hence they were treated symptomatically and kept in follow up.

Unlike few other studies, Henoch schonlein purpura, pophyria or Meckels diverticulum were not found in our study population. But as infants were not included in the study, cases of intussusceptions, volvulus or malrotation were not included in this study.

CONCLUSION

Our study helped us to identify the different spectrum of etiologies across the three age groups (1-5 years, 6-10 years, 11-15 years) and some diseases were showing male or female predilection. It also showed the increasing prevalence of urolithiasis and pancreatitis in children which may be due to the obesity epidemic and changing dietary habits. Also systemic causes of pain abdomen like

diabetic ketoacidosis and Henoch schonlein purpura should be ruled out. Long term follow up of children presenting with mesenteric adenopathy without other significant pathology is warranted to avoid unnecessary empirical antituberculous treatment.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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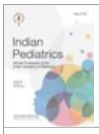

Severe Complications of Mumps

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Mumps is a common childhood infection caused by the mumps virus. We present a case series of three school-going children who had mumps parotitis following which they developed severe CNS and renal complications necessitating intensive care management.

An 11-year-old boy, first born of non consanguinous marriage and immunized according to national schedule along with one dose of MMR at 15 months of age, was admitted with complains of bilateral parotid swelling 2 weeks ago, associated with low grade fever that settled over next 5 days. Two days later, child developed headache with projectile vomiting and poor oral intake followed by one episode of generalized tonic clonic seizure and postictal vision loss. On examination, child had altered sensorium, bradycardia, hypertension, neck rigidity and papilledema. We suspected mumps meningo-encephalitis with raised intracranial pressure; magnetic resonance imaging (MRI) of brain was suggestive of diffuse leptomeningeal enhancement with gyral swelling and subcortical white matter edema. Child was managed in intensive care unit with ventilation and medication to reduce intracranial pressure. Three days later, he developed gross hematuria. Urine examination was suggestive of proteinuria. C3 was low, ASO and ANA were negative, and IgM mumps was strongly positive.

One month later, we saw a similar presentation in an 11-year-old girl, who had not received any prior MMR vaccine. She presented to us with secondary generalized left focal seizures following an episode of mumps like illness. CSF study showed 400 cells (mostly lymphocytes) with normal protein and sugar. Neuroimaging was suggestive of encephalitis with hyperintensities in temporoparietal cortical regions. She was treated in intensive care for two days with supportive care, including antiepileptics and measures to reduce raised intracranial pressure. From Day 9 of illness, child developed gross hematuria associated with persistent hypertension. Urinanalysis showed plenty of red blood cells with 1+ proteinuria and normal renal functions. IgM mumps serology was positive. Child was managed as glomerulonephritis with diuretics and anti-hypertensives.

An 8-year-old girl, developmentally normal and vaccinated for age, presented to us with seizures, hemiparesis and aphasia 5 days after onset of parotid swelling. On examination at the time of admission, child was conscious, and had motor aphasia, facial palsy and left sided hemiparesis. Bladder and bowel incontinence was present. Meningeal signs were absent. She was diagnosed as vasculitic stroke with acute infarct in right middle carotid artery territory. Workup for tuberculosis was negative. IgM mumps serology was strongly positive. Procoagulant workup revealed protein S deficiency, which was considered secondary to infection.

CDC recommends children to be given two doses of MMR vaccine, starting with the first dose at 12 through 15 months of age, and the second dose at 4 through 6 years of age. But it is still an optional vaccine in India, not yet included in the national immunization schedule. Recent outbreaks of mumps have been described in developed countries since 2005, and are caused by incomplete protection following vaccination, waning of immunity, and intensive crowding. Mumps currently affects mainly people who were vaccinated more than 10 years ago [1,2].

In India, MMR vaccine is an important component of the IAP-ACVIP schedule and being given at 9 month and 15-18 months [3]. Inclusion of MMR vaccine in our national immunization schedule is the need of the hour. MMR vaccine is a very effective way to prevent measles, mumps and rubella, among which both mumps and measles have serious CNS complications. Hence it is essential to give a complete coverage for these infections through immunization, both in toddlers and school-going children.

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Opinion

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Approach to immunodeficiency disorders

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Opinion

Immunodeficiency disorders can be classified into primary and secondary immunodeficiency disorders. The incidence is found to be 1:10000 which is more than PKU for which screening is available. An immunodeficiency disorder is a blanket terminology suspected in any children with recurrent infections. In children recurrent infection is normal up to 0 to 15 episodes of URI per year is considered normal in a well child. So the clinician is always faced with a dilemma whether it is normal for the age or serious immunodeficiency disorder.

Basics of immune system

i. The immune system starts at skin and mucosal barrier. Normally intact skin and mucosa constitutes a good barrier. In mucosa additional protective mechanism like mucus secretion , ciliary clearance, macrophages also play a role in preventing infection

ii. When the mucocutaneous barrier is breached, the innate immunity comes into play. This system is not specific for the pathogen. This includes phagocytises system, complement, inflammatory mediators, NK cells & cytokines IL2 and interferon gamma.

iii. If the pathogen is not cleared by innate immunity, then Antigen presenting cells (dendritic cells) stimulate CD 4 T cells. It can stimulate either Th1 or Th2 response. Th1 stimulates CD8 cells which are cytotoxic cells. Th2 response is hypersensitivity reaction. T cells are mainly utilized to activate B cell responses and to cope with intracellular pathogens

iv. CD4 T cells also stimulate B cells which mature to plasma cells & memory B cells. Plasma cells secrete antibodies. Memory B cells facilitate subsequent response to the same pathogen to be fast. Antibody-mediated defence is important against pathogens that produce toxins (eg, Clostridium tetani) or have polysaccharide capsules that interfere with phagocytises (eg, the pneumococci). It applies mainly to extracellular pathogens and their toxins.

Broadly they are classified as

i. Defects of antibody

ii. Combine B & T cell defect

iii. Phagocytic defect

iv. Complement defect

When to suspect primary immunodeficiency disorders: When > 2 of the following signs:

1. Four or more new ear infections within 1 year.
2. Two or more serious sinus infections within 1 year.
3. Two or more months on antibiotics with little effect.
4. Two or more pneumonias within 1 year.
5. Failure of an infant to gain weight or grow normally.
6. Recurrent, deep skin or organ abscesses.
7. Persistent thrush in mouth or fungal infection on skin.
8. Need for intravenous antibiotics to clear infections.
9. Two or more deep-seated infections including septicemia.
10. A family history of PI.

Questions to be answered:

1. Age of onset?
2. Pattern of infection
   - Pneumonia
   - Skin abscess
   - CSOM
   - Persistent diarrhoea
   - Persistent Oral thrush
   - Meningitis
   - Sepsis
   - Disseminated BCGosis
3. Failure to thrive
4. Family history & pattern of inheritance
5. Associated features (Thrombocytopenia, eczema, skeletal abnormality, persistence of primary dentition)
6. H/O atopy

Combined B & T cell defect:

1. Age of onset? à From birth
2. Pattern of infection: Predominantly viral infection , fungal infunction, protozoal & OI

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- Pneumonia à PCP/CMV
- Persistent diarrhoea
- Persistent Oral thrush
- Disseminated BCGosis

3. Failure to thrive
4. Family history: Previous sibling death , X linked SCID , WAS

This group includes SCID, Digeorge syndrome, Ataxia Telengectasia, Wiskot Aldrich syndrome

Predominantly B cell defect:

1. Age of onset? By 6-9 months after the maternal antibody wanes off
2. Pattern of infection: Infection by encapsulated organisms (st. pneumonia, H.influenza, Niesseria meningitis), M.catarrahalis, Pseudomonas, Staph aureus, Mycoplasma
   - Pneumonia
   - Sinusitis, otitis media
   - Skin abscess
   - Persistent diarrhoea (Giardia)
   - Meningitis (chronic meningitis by enterovirus in Agammaglobulinemia)
   - Sepsis
3. Failure to thrive: not common
4. Family history & pattern of inheritance: X linked - Agammaglobulinemia, Hyper IgM
5. Associated features: Common variable immunodeficiency has associated autoimmune disease & malignancy

It includes Bruton's Agammaglobulinemia, common variable immunodeficiency, Hyper IgM, selective IgA deficiency Phagocytic deficiency:

1. Age of onset? From birth
2. Pattern of infection : It includes staph aureus, burkholderia, Serratia, Aspergillus, nocardia, Mycobacterium, Salmonella
   - Pneumonia with pneumatocoele
   - Skin abscess
   - CSOM
3. Failure to thrive: Not common
4. Family history & pattern of inheritance: X linked chronic granulamatous disease
5. Associated features eczema, skeletal abnormality, persistence of primary dentitionà seen in hyper Ig E, Obstructive features like pyloric stenosis, intestinal obstruction, Ureteric stenos is seen in chronic granulamatous disease, Delayed umbilical cord separation à LAD , Albinism à Chediak Higashi syndrome
6. H/O atopy à Hyper Ig E

It includes either qualitative or quantities Quantitative: Severe congenital neutropenia(Kostmann syndrome), cyclical neutropenia Quantitative: Chronic granulamatous disease, Leukocyte adhesion defect, Hyper IgE, Chediak Higashi syndrome Complement deficiency:

1. Age of onset? Any age
2. Pattern of infection: Early complement deficiency presents with autoimmune disorders & pyogenic infection while late complement deficeiency presents with Neissseria meningitides

Investigations

1. Complete blood count
   a. Neutropenia: Repeat weekly to differentiate Severe congental neutropenia from cyclical neutropenia
   b. Leukocytosis in the absence of infection: LAD
   c. Throbocytopenia: WAS
   d. (Neutropenia & thrombocytopenia can be present in Organic acidemia also!!!)
   e. Eosinophilia : severe allergy, ABPA, Job's syndrome/Hyper Ig E, Omenn's syndrome (A form of SCID)
   f. Lymphopenia for age: SCID
   g. Birth < 2500/µL
   h. 5–6 Months up to 1 year < 4000/µL
   i. Adult < 1000/µL
   j. Normal ESR rules out serious bacterial & fungal infection
   k. Morphology: Small platelet-WAS, giant neutrophilic granule-chediak higashi syndrome
2. B cell defect: Immunoglobulin profile:
   a. Ig A can be done as screening test since selective IgA deficiency is the commonest. Normal rules out T & B cell defect.
   b. It can be low in protein losing states like nephritic syndrome, protein losing enteropathy, burns. In these scenarios specific antibody measurement helps.
   c. Antibody response to protein & polysaccharide antigen, isohemagglutinin (Blood group antibodies in children > 2 years)
   d. Isolated elevated Ig E àsevere allergy, ABPA, Job's syndrome/ Hyper Ig E
3. T cell Defect
   a. Delayed hypersensitivity response to Candida antigen (not reliable in younger children who is not exposed to antigen). Presence of BCG scar is a marker of intact T cell immunity
   b. In vitro response of T cell to phytohemagglutinin & mitogen
4. T and B cell markers Flow cytometry:
   a. Absent immunoglobulin & absent B cell markers à Brutons aggamaglobulinema
   b. Low immunoglobulin & Positive B cell markers à CVID
   c. Absent T cell markers à SCID. Various types associated with variable combination of absence of B / NK cell markers or both

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5. Phagocytic Function:
    a. Chronic granulamatous disease à NBT test, DHR flow cytometry assay
6. Comlement Function:
    a. CH50 (Classic & final pathway) & AH50 (Alternate pathway).

Other conditions to be which need to be considered

1. Immunodeficiency disorders not classified: IPEX (Immune Dysregulation, Polyendocrinopathy, Enteropathy and X-Linked Syndrome), X-Linked Lymphoproliferative Syndrome, Autoimmune Lymphoproliferative Syndrome ALPS.
2. Diseases Due to Defects in Interferon-gamma & Interleukin-12 Pathways (Mendelian susceptible mycobacterial disease).
3. Chronic mucocutaneous candidiasis.
4. Defects of DNA repair.
5. Where mucosal barrier is affected: Cystic fibrosis, immotile ciliary syndrome
6. Immune dysregulation: HLH.

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None.

Conflicts of interest

The author declares that there are no conflicts of interest.

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RESEARCH ARTICLE

Study on Nasal Tip Projection of South Indian Population to derive Reference Values for Corrective Nasal Surgeries

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ABSTRACT

Aim: The present study was taken up with an objective to derive reference values in relation to nasal tip projection (NTP) of Tamil Nadu population.

Materials and methods: The present study was conducted with the approval of the Institutional Ethics Committee. A total of 118 medical students from Velammal Medical College Hospital and Research Institute, Madurai, Tamil Nadu, India, participated in the study. Consenting students were included and individuals with noticeable facial disfigurement and with history of previous facial surgery were excluded. Goode method was used to analyze NTP.

Results: The present study reports NTP of 0.65 (0.66 in males and 0.64 in females) with standard deviation (SD) of 0.06 in South Indian population of Tamil Nadu region.

Conclusion: Nasal tip projection can be considered as a ratio that can be used while planning corrective nasal surgeries, and can be used in a simple and effective manner than other parameters like nasal angles and indices, and nasal morphology.

Clinical significance: The present study results will help surgeons avoid complications by anticipating the healing forces and take into account support mechanisms of the nasal tip when planning an optimal approach for esthetic nasal surgeries on patients, especially of our geographical area, and of the ethnic group that has been studied on. Also, surgeons from other parts of the world can use the present study results as reference while planning similar surgeries.

Keywords: Clinical, Corrective nasal surgeries, Nasal tip projection, Rhinology.

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INTRODUCTION

Nose shape plays a vital role for an individual's facial appearance. It is not uncommon to find people opting for cosmetic nasal surgeries these days. But for a surgeon it is very important to know which kind of nose really requires a correction. Several studies have been done by various authors to define criteria for an ideal nose. There have been studies on measurements of nose like nasal length, nasal width, nasal index, etc.[1,2] Several studies were also done on nasal angles like nasofrontal, nasofacial, and nasolabial angles.[3,4] But values reported by these studies have to be considered together in evaluating an ideal nose. Some authors lately have devised a simpler way toward evaluation of an ideal nose, which is NTP. The projection of the nasal tip is the distance at which the nasal tip protrudes from the face. There are various methods of evaluating NTP. Baum[5] defined NTP as the ratio between the line from tip defining point (TDP) perpendicular to the line between nasofacial and nasolabial angles that must be 1:2. Powell and Humphreys[6] made it even simpler by using the same perpendicular line but the ratio must be 1:2.8. Goode method uses a right triangle to define best NTP. The first side of the triangle is a line from nasofacial angle to alar crease, the second side is a perpendicular line from TDP to this line, and the third line is on the nasal dorsum from TDP to nasion.[7] Crumley and Lanser[8] recommend two new ways for formulating best NTP. In Crumley1, the ratio between the line from nasion to the vermillion and upper lip's skin junction perpendicular to the line from TDP must be 3.53. Crumley2 uses a triangle just like Goode but the posterior line continues its way and reaches the mandible profile at last. The ratio between this line with the perpendicular line to it must be 4.23. However, Goode method is supposedly the best one to analyze NTP.[9] In Goode's method, NTP is analyzed by measuring the line perpendicular to the facial plane to the nasal tip point/TDP divided by the nasion to TDP line. It is recommended that this value falls in the range of 0.55 to 0.6. When this ratio is high, that means nose is projected further away from face and is considered an overprojected nose. When the reverse happens, the nose is considered underprojected.[10]

But, as a universal rule, body parameters vary from region to region and are different with various ethnic

groups. Facial anthropometry among different nations is different and one of the most important factors regarding this issue is nasal shape.[11-13] There has not been much work done in defining an ideal nose using NTP as a parameter in Indian population. Therefore, authors of the present study proceeded to study medical students of Velammal Medical College Hospital and Research Institute, Madurai, Tamil Nadu, India, with an objective to derive reference values in relation to NTP of Tamil Nadu population.

MATERIALS AND METHODS

The present cross-sectional study was conducted during the months of January to April 2017. The study was approved by Institutional Ethics Committee, and was ethically conducted in accordance with Declaration of Helsinki. Written informed consent was taken from the participants before data collection. A total of 118 (43 males and 75 females) second year medical students (19–21 years of age) from Velammal Medical College Hospital and Research Institute, Madurai, Tamil Nadu, India, representing Tamil Nadu population participated in the study. Consenting students of Tamil Nadu origin were included (inclusion criteria). Individuals with noticeable facial disfigurement and with history of previous facial surgery were excluded (exclusion criteria). Sample size was calculated using sample size calculator presented as a public service of Creative Research Systems: Survey software, "The Survey System." Sample size was 118 (confidence level at 95%, and confidence interval of 4) of total 142 students (population).

Goode method was used to analyze NTP. Participants were positioned in anatomical posture with head positioned in Frankfurt horizontal (FH) plane. The FH plane is defined by a line connecting the orbital (the lowest point of the infraorbital margin) and the porion (point at the upper edge of the auditory meatus) or tragion (landmark on the upper edge of the tragus). This plane can be achieved by judging the relationship of upper and lower edges of the ear to the eyebrow level and the ala level respectively.[3] Lateral view photograph of face of each participant was taken. These photographs were later converted to pencil sketch photographs (using Android software) in order to get a clear outline of the lateral facial profile, as shown in Figure 1. Each such photograph was pro forma for data collection from each participant. Measurements were taken using Marcus Bader Ruler software. The parameters measured were (1) segment "a" (nasion to nasal TDP) and (2) segment "b" (line perpendicular to the facial plane "c" to the nasal tip) as indicated in Figure 1.

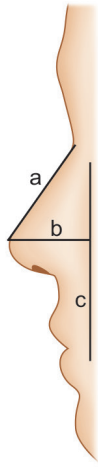


Fig. 1: Pencil sketch photograph indicating segments "a" and "b" and facial plane "c"

Nasal tip projection was later calculated using the two measured values, which is b divided by a (b/a). Mean and SD were calculated. Statistical analysis was done by the application of unpaired *t*-test using GraphPad software. Significance level was assessed with p-value < 0.05.

RESULTS

Observed values for segment "a" and "b" (measurements taken in millimeters) were tabulated in a master chart. Statistical values, namely mean, SD, standard error of mean (SEM), and 95% confidence interval (CI_{95}) of the difference in mean of the parameters of male (m) and female (f) participants, were estimated. Intermediate values in calculation were t value, degrees of freedom (df), and standard error of difference (SED). Table 1 indicates statistical findings for NTP. Statistical analysis (Table 2) was done with the application of unpaired t-test to assess if there was significant difference in NTP between male and female participants. The results were significant, which means significant difference existed between male and female participants in relation to NTP.

Linear regression graph plotting was done to know if any correlation existed among segments "a" and "b" of

Table 1: Statistical findings for NTP

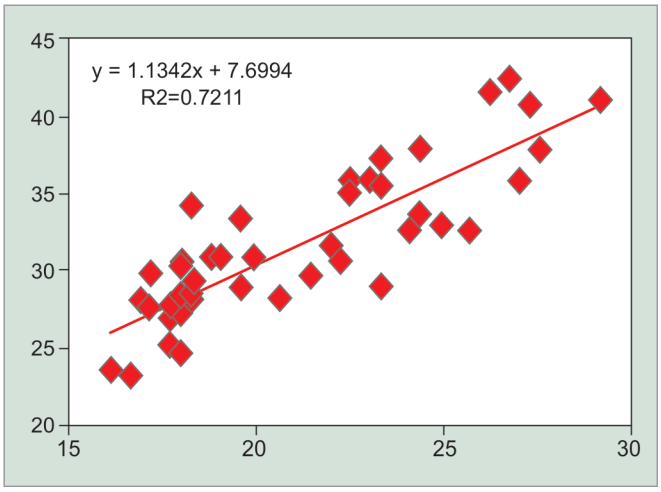
	Segment "a"			*Segment "b"*			*Nasal tip projection (b/a)*		
n	*Mean*	*SD*	*SEM*	*Mean*	*SD*	*SEM*	*Mean*	*SD*	*SEM*
Males (43)	31.72	4.83	0.737	21.18	3.62	0.552	0.663	0.06	0.0092
Females (75)	29.76	4.88	0.563	19.14	3.47	0.401	0.639	0.06	0.0069
Total (118)	30.47	4.93	0.0454	19.88	3.65	0.336	0.648	0.06	0.0056

SD: Standard deviation; SEM: Standard error of mean

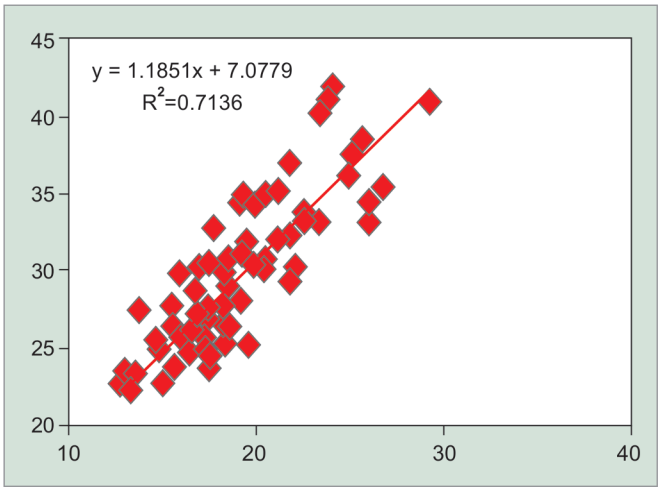
Table 2: Statistical analysis between male and female NTP

	CI_{95}	*t-value*	*df*	*Standard error of difference*	*p-value*	*Statistical significance*
Segment "a"	0.12–3.79	2.1047	116	0.930	0.0375	S
Segment "b"	0.7–3.373	3.0181	116	0.675	0.0031	HS
NTP	0.002–0.05	2.1171	116	0.011	0.0364	S

S; Significant; HS: High significant



Graph 1: Linear regression graph for segments "a" (vertical axis) and "b" (horizontal axis) of males



Graph 2: Linear regression graph for segments "a" (vertical axis) and "b" (horizontal axis) of females

males and females, and indeed, low positive correlation did exist between segment "a" and "b" of males (Graph 1 indicates the finding). Interestingly, high positive correlation was found between segment "a" and "b" of females, as indicated by Graph 2.

DISCUSSION

Rhinoplasty is a corrective nasal surgery, where postoperative late complications result from nasal healing that sometimes causes changes in nasal morphology and function.[14,15] The surgeon should anticipate these healing forces and take into account support mechanisms of the nasal tip when planning an optimal approach for surgery.[16] Rhinoplasty should focus on ideal levels of stability, symmetry, rotation, and projection which resist nose healing forces. An inappropriate resection of cartilage and the use of grafts and sutures can lead to nasal tip deformities, including ptosis, alar collapse, retraction, and pinching.[17] Therefore, it becomes very important for a surgeon to have an idea of the normal values of NTP for that particular region. The surgeon can thus focus on these normal values while deciding on patient suitability for rhinoplasty (patients with over- and under-projected noses will thus be obvious candidates for rhinoplasty). The surgeon can also consider these reference NTP values as target values during postoperative period.

Hardly any studies have been reported on NTP till date. There have been more speculations on NTP than actual research. However, two studies, Fagundes et al[10] and Mohebbi et al,[18] have reported on NTP lately, of which method adopted (Goode method) by the present study was the same as that by Fagundes et al. In a study by Fagundes et al, Brazilian patients with predominant Caucasian features were the participants. In that study, 27 preoperative patients were identified who were followed until postoperative period, and NTP was analyzed separately during the two periods on the same patients. The study reported NTP of 0.69 with an SD of 0.09 during preoperative period and NTP of 0.67 later. In comparison, the present study involved South Indian (never before operated) medical students, and reports NTP of 0.65 with SD of 0.06. Mohebbi et al[18] reported on NTP that was derived from other methods.

The only limitation of the study was inability to accurately position the participants' heads in FH plane. Even with best of efforts, it was not possible to achieve perfect positioning. More important is uniformity in positioning the heads in the same plane, which too is hard to achieve. This limitation can be overcome by using an apparatus or a mount to place the participants' heads in the FH plane.

Knowledge of normative values of external nose angles like nasofrontal, nasolabial, nasofacial, nasomental angles is quite helpful for a surgeon while planning an approach for corrective nasal surgeries. Nasal measurements and nasal indices are also equally helpful. But the authors of the present study believe that NTP, for a particular geographical area and ethnic group, is much simpler for the surgeon in these esthetic nasal surgeries. The present study is a guide for the same purpose.

CONCLUSION

Authors conclude by reporting NTP of 0.65 (0.66 in males and 0.64 in females) with SD of 0.06 in South Indian population of Tamil Nadu region. This means males in this area have a slightly overprojected nose. It was also found that the segments considered for deriving NTP were positively correlated. This meant that long noses are overprojected than shorter ones. Last but not the least, NTP can be considered as a ratio that can be used while planning corrective nasal surgeries, and can be used in a simple and effective manner than other parameters like nasal angles and indices, and nasal morphology.

CLINICAL SIGNIFICANCE

Rhinoplasty is a corrective nasal surgery, where postoperative late complications result from nasal healing that sometimes causes changes in nasal morphology and function. The present study results will help surgeons avoid these unforeseen complications by anticipating these healing forces and take into account support mechanisms of the nasal tip when planning an optimal approach for esthetic nasal surgeries on patients, especially of our geographical area, and of the ethnic group that has been studied on. Surgeons from other parts of the world can use the present study results as reference while planning similar surgeries. Last but not the least, NTP is an easy way of evaluating patients with over- and underprojected nose while recommending rhinoplasty for these patients in whom NTP is expected to normalize postsurgery.

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Original Research Article

A comparative study of Fentanyl and Clonidine as additives to plain Bupivacaine in caudal anaesthesia in children

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Abstract

Introduction: The efficacy of clonidine or fentanyl as additives to alter the neuroendocrine stress response and emergence agitation in caudal anaesthesia in children is still not clear. **Objectives:** To compare the efficacy and safety of Fentanyl and Clonidine as additives to plain bupivacaine in caudal anaesthesia in children. **Materials & Methods:** A prospective, open labeled randomized controlled trial was conducted in Meenakshi Mission Hospital and Research Centre, Madurai, between August 2008 to June 2010. Children undergoing various elective infra-umbilical surgical procedures were included. Children were randomly assigned to either 0.5% Bupivacaine(B), Fentanyl plus 0.5% Bupivacaine (BF) or Clonidine Plus 0.5% Bupivacaine (BC) groups. **Results:** A total of 90 children, with 30 subjects in each of the three intervention groups were included. Time taken for spontaneous movement was significantly higher (151.8±11.7) in BC group, as compared the other two groups. The duration of postoperative analgesia was lowest in Bupivacaine (146±91.2) alone group, followed by BF (293.5±154.5) and BC group (510±359.9). Sedation time also has shown a similar trend. The mean pain scores from 2 hours to 24 hours were highest in bupivacaine group, followed by BF and BC group. The differences in the sedation scores across the three study groups from 45minutes to 24-hour post-operative period were statistically significant. **Conclusions:** Addition of clonidine 1µg/kg to 0.5% bupivacaine prolonged the duration of postoperative analgesia after a single shot caudal injection without any significant side effects when compared to bupivacaine 0.5% alone or its combination with fentanyl 1µg/kg.

Key words: Caudal Anaesthesia, Fentanyl and Clonidine, Children.

Introduction

The pain pathways in infancy are underdeveloped and the threshold of stimulation and sensation of pain is low at birth and the potential impact of effects of pain on the central nervous system is also high. Consequently, inappropriate pain management can influence the child's morbidity and mortality [1]. Owing to a better understanding of the neurobiology of pain in the past three decades, it has been observed that pain managing practice that use one type of pain reliever to control one of the pain pathways are usually less effective compared to those that use a combination of analgesics that control multiple pathways [2].

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Postoperative pain causes harmful effects like variations in hemodynamic parameters in the form of rising in blood glucose, behavioral and neuroendocrine stress response in the form of increased cortisol levels, catecholamines and growth hormone [3,4]. Such responses are observed both among adults and children alike and altering this pain control process might influence the expected outcome favorably. These responses occur not only in adults but in children as well and modulation of these may favorably influence the ultimate outcome.

Opioid drugs like morphine and ketamine have been the mainstay for treatment of moderate to severe pain but have their usual side effects like nausea, vomiting,

constipation, respiratory depression and urinary retention [5]. However, there have been attempts of decreasing their use by addition of other analgesics or techniques targeting various parts of the pain pathway to achieve equal or better analgesia. Caudal anesthesia is the oldest and presently the most widely used epidural method in children. For infra-umbilical operations in children, the caudal block is usually the preferred method of post-operative analgesia as it produces excellent and predictable pain relief, safe and easy to perform associated with least complications [6,7].

Bupivacaine is the most preferred anesthetic for caudal block owing to it being long acting and relatively safe. Adjuvants like ketamine, morphine, fentanyl, clonidine have shown to improve the quality and duration of analgesia with varying degree of success [8, 9].

Clonidine is a common adjuvant [8, 10] with insignificant respiratory depression, bradycardia, though, its right dose with bupivacaine is still debatable. Also, some studies claim that addition of clonidine with bupivacaine in the caudal block has no additional advantage as compared to bupivacaine alone [11].

Some studies reported a satisfactory postoperative analgesia of fentanyl with bupivacaine [12] without much influence on the cardio-respiratory system. However, the efficacy of clonidine or fentanyl to alter the neuroendocrine stress response and emergence agitation is still not clear. Hence the present study assessed the combined effect of clonidine and fentanyl with bupivacaine in prolonging post-operative analgesia after caudal block in children.

Objectives

To compare the efficacy and safety of Fentanyl and Clonidine as additives to plain bupivacaine in caudal anaesthesia in children

Materials and Methods

Study design: The current study is a prospective, open labeled randomized controlled trial

Study setting: The study was conducted in Meenakshi Mission Hospital and Research Centre, Madurai, Tamil Nadu

Study duration: The study was conducted between August 2008 to June2010.

Study population: The study population included, children undergoing various elective infra-umbilical surgical procedures in the study setting. The study population was randomly assigned to three of the intervention groups

Group B: Who have been administered with 0.5% Bupivacaine

Group BF: Administered with Fentanyl, in addition to 0.5% Bupivacaine

Group BC: Administered with Clonidine in addition to 0.5% Bupivacaine.

Inclusion criteria

1. aged 10 months to 10 years
2. ASA physical status 1 and 2,
3. Elective infra-umbilical surgeries

Exclusion criteria

1. Emergency surgical procedures
2. Not willing to provide consent

Sample size: Considering the minimum difference in duration of sensory block to be detected as 30 minutes, with a standard deviation of 25 minutes with 90% power of study and 5% alpha error, to assess two pairwise comparisons using ANOVA, the required sample size would be about 15 subjects in each group. To account for a loss to follow up of 10%, it was decided to include, not less than 17 subjects I each of the study groups. Sample size was calculated using STATA IC software version 13.

Randomization: The study subjects were randomly assigned to three of the intervention groups using computer-generated random number sequence, after reassigning, a set of numbers to each intervention

Blinding: Considering the nature of the intervention, the anesthetist blinding was not possible. Participants and the statistician analyzing the data were blinded to the intervention.

Allocation concealment: The allocation sequence was kept in sealed opaque envelopes in the custody of an independent statistician and was opened after the recruitment of each subject and the intervention was administered accordingly.

Ethical issues: The study was approved by the institutional human ethics committee. Informed written consent was obtained from the parents or guardian of all the children, after explaining the risks and benefits of the intervention. The confidentiality of the study participants was maintained.

Statistical analysis: All the three study groups were compared, with respect to all the baseline variables, using mean and standard deviation for quantitative variables, frequency, and proportion for categorical variables. ANOVA and chi square test were used respectively to test the statistical significance of the differences. IBM SPSS version 22 was used for statistical analysis.

Results

A total of 90 children, with 30 subjects in each of the three intervention groups were used. There is no statistically significant difference in the age composition of the children in three groups. There is no statistically significant difference in the sex composition of the children in three groups. The weights of the children in the three groups are similar. Duration of surgery in three groups was comparable (Table 1).

Table-1: Age and gender distribution of the study participants.

Parameters	Group B	Group BF	Group BC	P value
Age (Mean ± SD)	3.13 ± 1.74	3.27 ± 2.24	3.23 ± 2.08	0.9683
Male : Female Ratio	**30:0**	**29:1**	**28:2**	
Weight	13.37 ± 2.72	14.0 ± 3.22	13.73 ± 2.83	0.7502
Duration of surgery	51.5 ± 14.4	53.3 ± 11.5	53 ± 14.1	0.6227

The time taken for the spontaneous movement was significantly higher at 151.8 ± 11.7 in BC groups, as compared the other two groups. The duration of postoperative analgesia was lowest in Bupivacaine (146 ± 91.2) alone group, followed by BF (293.5 ± 154.5). It was longest in BC group (510 ± 359.9). Sedation time also has shown a similar trend with the shortest duration in Bupivacaine alone group, followed by BF group and longest in BC group. The differences between the three groups in all these parameters were statistically significant. (Table 2)

Table-2: Comparison of analgesic efficacy among the three groups.

Parameter	Group B	Group BF	Group BC	P value
	Mean ± SD	Mean ± SD	Mean ± SD	
Time taken for spontaneous movement	149.2 ± 14.6	149.2 ± 14.6	151.8 ± 11.7	**0.007**
Post-operative Analgesia (in minutes)	146 ± 91.2	293.5 ± 154.5	510 ± 359.9	**<0.001**
Sedation time (in minutes)	237.5 ± 104.9	500.7 ± 272.7	624 ± 254.9	**0.0001**

No statistically significant differences were found in the mean postoperative pain scores, a cross the three study groups in the initial 60-minute post-operative period. The mean pain scores from 2 hours to 24 hours were highest in bupivacaine alone group, followed by BF groups and were least in BC group. The differences in the mean pain scores across the three groups from 2 to 24-hour post-operative period were statistically significant with P values <0.05. (Table 3)

There was no statistically significant difference in the sedation scores, between the two study groups in the initial 30-minute post-operative period. From 45-minute post-operative period to 24-hour post-operative period, the sedation score was lowest in bupivacaine alone group, followed by BF group and highest in BC group. The differences in the sedation scores across the three study groups from 45 minutes to 24-hour post-operative period were statistically significant. (Table 4).

Table-3: Comparison of postoperative pain scores across the three study groups.

Post-operative Pain Score at	Group B	Group BF	Group BC	P value
	Mean ± SD	Mean ± SD	Mean ± SD	
15 minutes	1.72 ± 1.51	1.67 ± 1.37	1.33 ± 1.15	0.3921
30 minutes	2.2 ± 1.35	2.37 ± 0.93	2.1 ± 0.55	0.0997
45minutes	1.93 ± 1.6	1.8 ± 1.32	1.4 ± 0.97	0.113
60 minutes	1.77 ± 1.69	1.53 ± 1.61	0.93 ± 1.11	0.1156
2 hours	2.53 ± 1.36	1.3 ± 1.44	1.3 ± 1.18	**< 0.001**
3 hours	3.53 ± 1.14	1.77 ± 1.55	1.2 ± 1.16	**< 0.001**
4 hours	3.6 ± 1.19	2.8 ± 1.45	1.87 ± 1.1	**< 0.001**
6 hours	4.23 ± 1.72	3.67 ± 0.76	2.3 ± 1.15	**< 0.001**
8 hours	3.27 ± 2.26	3.4 ± 1.23	2.53 ± 1.04	**0.01**
12 hours	2.78 ± 1.78	4.4 ± 2.34	1.87 ± 1.25	**< 0.001**
24 hours	2.13 ± 1.7	3.37 ± 1.19	1.73 ± 1.2	**< 0.001**

Table-4: Comparison of Post-Operative Sedation Score at various time intervals among the study groups.

Post-operative Sedation Score at	Group B	Group BF	Group BC	P value
	Mean ± SD	Mean ± SD	Mean ± SD	
15 minutes	2.3 ± 0.47	2.27 ± 0.45	2.3 ± 0.47	0.9479
30 minutes	2.03 ± 0.18	2.1 ± 0.31	2.03 ± 0.18	0.4327
45minutes	2 ± 0.26	2.23 ± 0.43	2.27 ± 0.45	**0.0221**
60 minutes	2.1 ± 0.55	2.43 ± 0.57	2.5 ± 0.51	**0.0493**
2 hours	2.03 ± 0.49	2.43 ± 0.63	2.4 ± 0.5	**0.0085**
3 hours	1.57 ± 0.5	2.33 ± 0.61	2.47 ± 0.51	**< 0.001**
4 hours	1.42 ± 0.54	2.03 ± 0.56	2.2 ± 0.41	**< 0.001**
6 hours	1.33 ± 0.48	1.63 ± 0.49	2.1 ± 0.48	**< 0.001**
8 hours	1.21 ± 0.28	1.47 ± 0.21	1.83 ± 0.33	**< 0.001**
12 hours	1.33 ± 0.33	1.37 ± 0.76	1.67 ± 0.25	**< 0.001**
24 hours	1.22 ± 0.35	1.33 ± 0.76	1.57 ± 0.51	**< 0.001**

The percentage change in the heart rate was comparable across the study groups at various time intervals was comparable across the study groups, with a minor differences. (Figure 1)

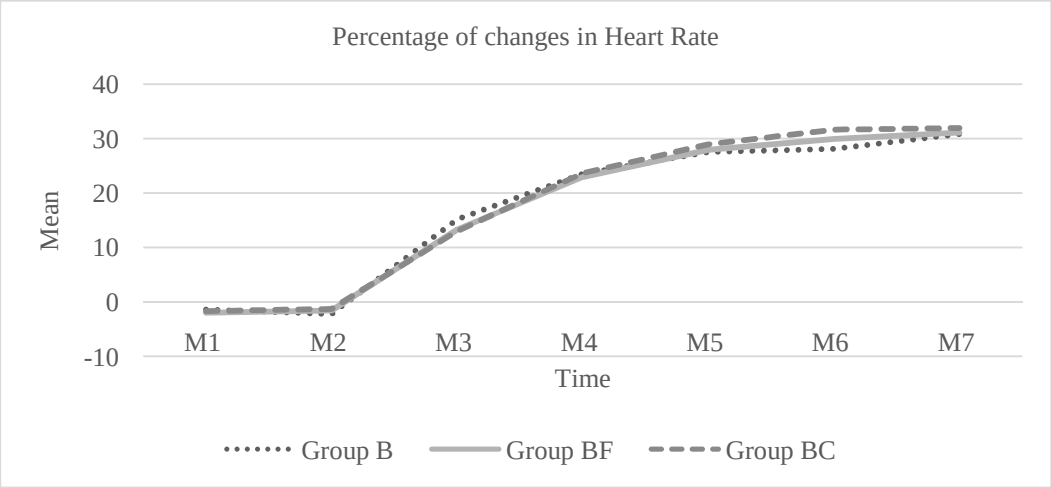

Figure-1: Trend diagram, comparing the percentage of changes in Heart Rates at various time intervals.

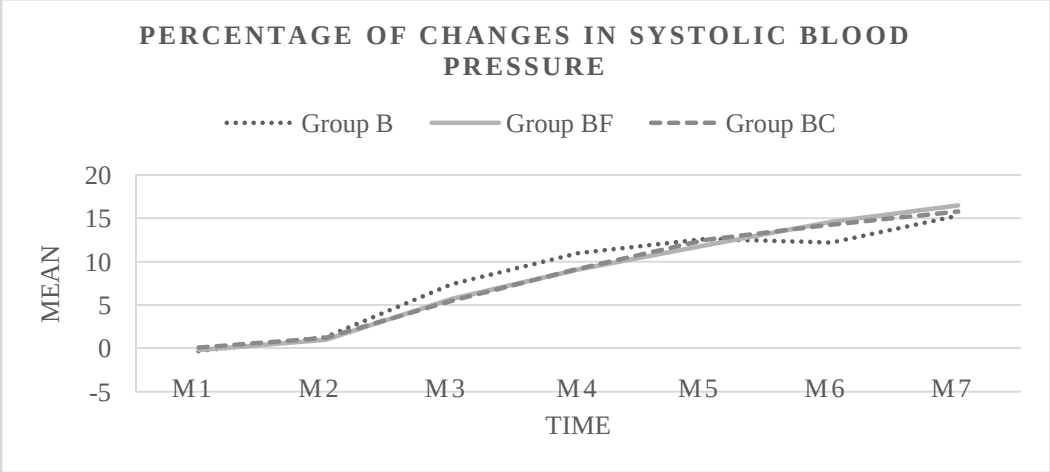

Figure-2: Trend diagram, comparing the percentage of changes Systolic Blood Pressure at various time intervals

The percentage change in the systolic blood pressure was comparable across the study groups at various time intervals was comparable across the study groups, with minor differences. (Figure 2)

Discussion

Though Sevoflurane is favored inhalational agent for inducing anesthesia in pediatric patients, it is associated with non-purposeful restlessness and agitated behavior usually termed as emergence agitation. However, the exact basis behind such an alteration is unknown and unrelieved pain remains one of the suggested causes [13]. For an effective postoperative pain management and to prevent emergence agitation, the chosen method has been a caudal block with a local anesthetic with or without adjuvants (fentanyl, clonidine) especially for infra umbilical surgeries. A single shot of caudal block provides effective postoperative analgesia and the duration of the block can be prolonged by using an adjuvant like opioids (fentanyl) [14] and more recently α^2-agonist (clonidine) [15].

The findings of the study showed a statistically significant difference in the duration of postoperative analgesia and sedation among the three groups. This was in line with the double blind study by Akin et al., [16] in 60 children aged 2-8 years undergoing inguinal hernia repair, with one group of 20 received 0.25% levobupivacaine alone while two other groups were given additionally 2 micrograms per kg body weight of clonidine with or without 5 ml saline found that caudal clonidine prolonged the duration of analgesia induced by levobupivacaine without significant side effects. Similarly a double-blind study by Ahuja S et al., [17] among 60 Indian children with three groups of 0.25% bupivacaine alone (group I), additionally with 1 microgram/kg fentanyl (group II), 3 micro gram/kg clonidine (group III) concluded that caudal clonidine prolonged analgesia and decreased emergence agitation as compared to bupivacaine alone or fentanyl.

Not only bupivacaine, even Ropivacaine has been shown to produce prolonged analgesia when combined with clonidine or fentanyl in epidural anesthesia without affecting the pharmacodynamics profile of the drugs and with significantly fewer side effects [18,19].

Though fentanyl and clonidine do enhance the analgesic duration of bupivacaine, clonidine, in particular, is shown to have lesser side effects like reduced postoperative nausea and better patient satisfaction [11, 14, 20, 21].

Conclusions

To conclude the addition of clonidine 1µg/kg to 0.25% bupivacaine administered as 1ml/kg prolonged the duration of postoperative analgesia in children undergoing sub umbilical surgeries after a single shot caudal injection without any significant side effects when compared to bupivacaine 0.25% alone or its combination with fentanyl 1µg/kg.

Limitations

1. As the investigator blinding was not possible, the possibility of interviewer bias could not be eliminated completely

2. Even though good baseline was achieved among the study groups, in terms of potential confounders, the magnitude of residual confounding could not be assessed by regression analysis, considering the smaller sample size.

3. Since multitude of surgeries was involved, the role of type of diseases and type of surgery performed as confounders also could not be evaluated

Recommendations: Further large-scale studies preferably conducted on subjects undergoing, similar surgical procedure may provide us more valid comparisons

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A Statistical Model to Predict Instantaneous Blood Pressure Using Velocity Measurements in the Radial Arteries.

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ABSTRACT

Background: Ambulatory BP monitoring (ABPM) provides a more reliable measure of a patient's BP than isolated clinic measures for continuous monitoring and rigorous control of hypertension. Regular users of ABPM hesitate to wear it because of aesthetic considerations and pain during inflation and deflation of the cuff. **Methods:** A statistical model is suggested from this study to aid in the development of wearable ABPM on the wrist which would aesthetical be acceptable and without pain. The model uses Blood flow velocities of the left and right radial arteries and their wall thickness to predict the Blood pressure at the right arm. Blood flow velocities (Peak systolic velocity- PSV and End diastolic velocity - EDV in cms/sec) and vessel wall thickness (in mm) were measured using B mode ultrasound and Doppler of 99 healthy persons. **Results:** The blood pressure of the right arm was measured using a mercury sphygmomanometer prior to the measurement of the Blood flow velocities. Systolic BP = 1.183 (LRA PSV) + 38.903 (LWT) +72.193, Diastolic BP = 5.211 (LRA EDV) + 56.071 (LWT) + 26.231, Systolic BP = 1.753 (RRA PSV) + 40.060 (RWT) +59.659, Diastolic BP = 4.302 (RRA EDV) + 28.378 (RWT) + 42.795. **Conclusion:** This statistical model needs further refinement and can be only used as an initial step in the modeling of Blood pressure based on the Blood flow velocities in the development of wrist- wearable ABPM instruments.

Keywords: Diastolic BP, Predicting, Systolic BP.

INTRODUCTION

According to World Health Organization the World Health Statistics of 2012 29.2 percent of men and 24.8 percent of women have high blood pressure.[1] Hypertension is universally-recognized as a predictor of cardiovascular, circulatory and cerebrovascular disease events where early treatment and control of blood pressure is required. Ambulatory blood pressure monitoring (ABPM) at regular intervals for 24 hours sense some blood pressure behaviors that are correlated with disease risk.[2] It has been very useful in identifying dippers from non-dipper blood pressure pattern during sleep which is reported as a predictor of cardiovascular and cerebrovascular risk. ABPM is also very useful in evaluating the effectiveness of oral antihypertensive medication. ABPM uses Sphygmomanometer. Daily users of ABPM hesitate to wear it because of pain during inflation and deflation of the cuff which could potentially damage tissue and because of the noises from cuff, and its appearance. Simpler instruments should be developed to monitor blood pressure during ambulation without the difficulties of wearing a cuff. An ambulatory blood pressure monitor attached to the wrist may be attractive aesthetically for users. This study will test the hypothesis that Blood pressure at the arm can be predicted using Peak blood flow velocities in the Radial arteries. The results could be used in the development ABPM instrument which is user friendly, wearable sensing system at the wrist and aesthetically acceptable.

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MATERIALS AND METHODS

Both male and female who visited the master health clinics were included in this study. A total of 99 subjects took part in this study of which 60 (61%) were males and 39 (39%) were females. Subjects with major illnesses including cardiovascular illness and on antihypertensive medications were excluded. Sonographic examination of the abdomen is a routine examination for these subjects during which blood flow velocities in radial arteries were additionally determined sonongraphically. Supine

Blood pressure was measured on the right arm by mercury sphygmomanometer before the time of determination of blood flow velocities at the radial arteries.

Gray scale B mode ultrasound and doppler study was done using high frequency linear probe (10 – 12 MHz) of GE VolusonP8 and E8 Expert ultrasound machines. Vessel Wall thickness, calcification and plaques were measured in distal radial artery at the wrist in both upper limbs. On spectral Doppler, angle corrected Peak Systolic Velocity (PSV) and End Diastolic Velocity (EDV) was measured by placing the sampling gate at the center of the lumen.

RESULTS

Table 1: Demographic characteristics of the study subjects.

Demographic characteristics	Frequency (n)	Percent (%) **
Sex		
Male	60	61
Female	39	39
Age group		
Below 30	7	7
31-40	17	17
41-50	32	33
51-60	20	20
Above 60	23	23

**Rounded off

[Table 1] presents the demographic characteristics of the study subjects. From the findings, it is observed that the majority of the subjects are male (61%) whereas the females are only 39 percent. When the age groups of the subjects are considered, around 33 percent of the subjects aged between 41 and 50 years which are followed by, 23 percent aged more than 60 years age group, 20 percent aged 51-60 years and a minimum number of subjects are below 30 years age group.

Table 2: Descriptive statistics for the blood pressure parameters.

Parameters	Min.	Max.	Mean	SD
Systolic BP	100.0	190.0	127.27	15.64
Diastolic BP	60.0	110.0	79.70	11.91
RRA PSV	21.0	55.0	30.66	6.58
RRA EDV	2.0	12.0	6.29	1.94
LRA PSV	17.0	60.0	34.88	10.39
LRA EDV	2.0	11.0	6.43	1.43
RWT	0.3	0.6	0.35	0.06
LWT	0.3	0.5	0.36	0.06

RRA PSV – Right Radial Artery Peak Systolic Velocity (cms/sec)
RRA EDV - Right Radial Artery End Diastolic Velocity (cms/sec)
LRA PSV – Left Radial Artery Peak Systolic Velocity (cms/sec)
LRA EDV - Left Radial Artery End Diastolic Velocity (cms/sec)
RWT – Right Wall Thickness (mm)
LWT – Left Wall Thickness (mm)

[Table 2] shows the summary statistics like minimum, maximum and mean of the study parameters. On an average, the subjects have 127.27±15.64 mmHg systolic BP, 79.70±11.91 mmHg diastolic BP, 30.66±6.58 cms/sec RRA PSV, 6.29±1.94 cms/sec RRA EDV, 34.88±10.39 cms/sec LRA PSV, 6.43±1.43 cms/sec LRA EDV, 0.35±0.06 mm RWT and 0.36±0.06 mm LWT.

Hypothesis (H1): LRA PSV and LWT are positive relationship with systolic BP.

Table 3: Predicting systolic BP with the assistance of LRA PSV and LWT.

Predictors	Unstandardized Coefficients		Adjusted R-square	t-value	p-value
	Beta (β)	SE			
(Constant)	72.193	4.929	0.740	14.645	0.000
LRA PSV	1.183	0.087		13.571	0.001**
LWT	38.903	15.274		2.547	0.012**

Dependent Variable: Systolic BP **p<0.01

[Table 3] shows the regression model. In the model, LWT and LRAPSV are considered as independent variables while systolic blood pressure is considered as the dependent variable. The systolic blood pressure of the subjects depends on the LWT and LRA PSV as the statistical significance values are below 5 percent level (both p values<0.05). Also, LWT and LRA PSV explain around 74 percent variations in the systolic blood pressure (Adjusted R-square=0.740). Finally, the beta coefficient of LWT reveals that for every unit increase in LWT, 38.903 unit increases in systolic blood pressure is predicted. Similarly, for every unit increase in LRA PSV, 1.183 unit would increase in systolic blood pressure. Hence, the hypothesis '(H1): LRA PSV and LWT are positive relationship with systolic BP' is Valid.

The statistical model is given below:

Systolic BP = 1.183 (LRA PSV) + 38.903 (LWT) +72.193.

Hypothesis (H2): RRA PSV and RWT are positive relationship with systolic BP.

Table 4: Predicting systolic BP with the assistance of RRA PSV and RWT.

Predictors	Unstandardized Coefficients		Adjusted R-square	t-value	p-value
	Beta (β)	SE			
(Constant)	59.659	5.330	0.684	11.194	0.000
RRA PSV	1.753	0.157		11.198	0.001**
RWT	40.060	16.411		2.441	0.016*

Dependent Variable: Systolic BP **p<0.01, *p<0.05

Association between systolic blood pressure, RRA PSV and RWT is shown in [Table 4]. In the statistical model, systolic blood pressure is defined as a dependent variable while RWT and RRA PSV are defined as independent variables. From the statistical significance (p- values<0.05), it is inferred that systolic blood pressure depends on the RRA PSV and RWT. In addition, the independent

variables explain around 68 percent variation in the value of systolic blood pressure (Adjusted R-square: 0.684). Hence, the hypothesis '(H2): RRA PSV and RWT are positive relationship with systolic BP' is Valid.

On the basis of the beta coefficients, the statistical model can be created in the following manner:

Systolic BP = 1.753 (RRA PSV) + 40.060 (RWT) +59.659.

Hypothesis (H3): LRA EDV and LWT are positive relationship with diastolic BP.

Table 5: Predicting diastolic BP with the assistance of LRA EDV and LWT.

Predictors	Unstandardized Coefficients		Adjusted R-square	t-value	p-value
	Beta (β)	SE			
(Constant)	26.231	5.864	0.519	4.473	0.000
LRA EDV	5.211	.592		8.804	0.001**
LWT	56.071	14.275		3.928	0.001**

Dependent Variable: Diastolic BP; **p<0.01

From the [Table 5], it is noticed that LWT and LRA EDV do the significant influence on the diastolic blood pressure. Since, the statistical significance values are below 5 percent level (both p values<0.05). As per the coefficient of determination (Adjusted R-square=0.519), LWT and LRA EDV explain around 52 percent variations in the diastolic blood pressure. Finally, the beta coefficient of LWT depicts that for every unit increase in LWT, 56.071 unit increase in diastolic blood pressure is predicted. Similarly, for every unit increase in LRA EDV, 5.211 unit will increase in diastolic blood pressure. Hence, the hypothesis '(H3): LRA EDV and LWT are positive relationship with diastolic BP' is Valid.

The statistical model is given below:

Diastolic BP = 5.211 (LRA EDV) + 56.071 (LWT) + 26.231.

Hypothesis (H4): RRA EDV and RWT are positive relationship with diastolic BP.

Table 6: Predicting diastolic BP with the assistance of RRA EDV and RWT

Predictors	Unstandardized Coefficients		Adjusted R-square	t-value	p-value
	Beta (β)	SE			
(Constant)	42.795	4.523	0.579	9.463	0.000
RRA EDV	4.302	0.427		10.080	0.001**
RWT	28.378	13.217		2.147	0.034*

Dependent Variable: Diastolic BP; **p<0.01, *p<0.05

Association between diastolic blood pressure, RRA EDV and RWT is shown in [Table 6]. In the statistical model, diastolic blood pressure is defined as a dependent variable while RWT and RRA EDV are defined as independent variables. From the statistical significance (p- values<0.05), it is inferred that diastolic blood pressure depends on the RRA EDV and RWT. Also, the independent variables such as RRA EDV and RWT explain around 58 percent variation in the value of diastolic blood pressure (Adjusted R-square: 0.579). Therefore, the hypothesis '(H4): RRA EDV and RWT are positive relationship with diastolic BP' is valid. On the basis of the beta coefficients, the statistical model can be writtenin the following manner:

Diastolic BP = 4.302 (RRA EDV) + 28.378 (RWT) + 42.795.

DISCUSSION

Ambulatory BP monitoring provides a more reliable measure of a patient's BP than isolated clinic measures and is useful for monitoring BP in patients with labile hypertension, poor control despite using appropriate antihypertensive therapy;[6,7] worsening end-organ damage, in patients where rigorous control of blood pressure is essential, and in cases of suspected syncope or orthostatic hypotension, in patients with symptoms or evidence of episodic hypertension and to detect 'white-coat effect.[3-4]

According to Tolonen et al.[11] several factors affect BP measurement such as environmental factors, vigorous physical activity, heavy meal or smoking before measurement, cuff size, calibration error, left vs. right arm, supine vs. sitting, and these results in variations from 1–2 mmHg up to 20–50 mmHg in individual measurements.

While clinic measurement of BP is useful for screening, and in the management of suspected and true hypertension, ambulatory BP and home BP measurements add considerably to the accurate diagnosis of hypertension and the provision of optimal care. The Newer measurement techniques use different algorithms to measure the Blood pressure and work on the principles of Auscultation (Korotk off sounds), Cuff oscillometry, which relies on detection of cuff pressure oscillations and volumetric oscillometry using detection of volume pulsations under a cuff.[8] All these techniques use the vascular phenomenon of wave form transmission to detect blood pressure.

In a study on new born infants Blood flow velocity in the major cerebral and renal arteries was related to blood pressure.[9] Another study found that there was a significant relationship between Dental pulp blood flow velocity and systolic blood pressure.[10] We hypothesized that if blood pressure influences blood flow velocity then it should be possible to predict Blood pressure based on the Blood flow velocity provided the factors influencing pressure and flow velocity remain constant. We have not used vessel diameter in this model because at any given instance the diameter remains same. However, blood pressure may be influenced by the pliability of the vessel wall for the same diameter in different individuals at a given instance hence the thickness of the wall was included.

Systolic BP = 1.183 (LRA PSV) + 38.903 (LWT) +72.193
Systolic BP = 1.753 (RRA PSV) + 40.060 (RWT) +59.659
Diastolic BP = 4.302 (RRA EDV) + 28.378 (RWT) + 42.795
Diastolic BP = 5.211 (LRA EDV) + 56.071 (LWT) + 26.231

This statistical model allows for the study of both normal and pathological variations of blood pressure at the right arm. It may be also used to monitor rapid changes in blood pressure dynamics resulting from ventilatory or pharmacological manipulation, or from clinical deterioration.

The new clinical guideline for hypertension from the National Institute for Health and Clinical Excellence considers an interarm difference of less than 10 mm Hg to be normal and attributes a difference of more than 20 mm Hg to underlying vascular disease. Although there is inter-arm variability accommodated within this statistical model it cannot be used to predict inter-arm variability of blood pressure. The reason being that the blood flow velocities of the right radial artery and the blood flow velocities in the left radial artery both predict only the blood pressure at the right arm. This is an inherent weakness in this model. However this statistical model could be used as an early step in modeling blood pressure from Blood flow velocities in the development of ambulatory blood pressure monitors.

CONCLUSION

In summary, the statistical model developed from our study indicate the possibility of modeling and predicting blood pressure on the right arm using the blood flow velocities measured at the right radial artery and the left radial artery with their respective vessel wall thickness. Although there is inherent weakness in the predictability of interarm blood pressure variation yet it is encouraging to have a working statistical model as an initial step in predicting blood pressure using blood flow velocities in the development of ambulatory blood pressure monitors.

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Computed Tomography Evaluation of Supratentorial Brain Tumours.

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ABSTRACT

Background: Imaging modalities like CT and MRI may play a vital role in diagnostic evaluation of CNS neoplasms.But the relative superiority of these modalities is intensely debated in the literature. Computed tomography, with it's wider availability, lesser cost and higher efficacy in differentiating calcification/ hemorrhage which can play a vital role in resource-poor settings. **Methods**: The current study was a prospective observational study of 50 patients with supratentorial brain tumours reporting to radiology department for CT brain, in a tertiary care teaching hospital in south India. **Results**: Glioma (48%) was the most common tumour.Pilocyticastrocytomas and low-grade Glioma were seen in younger and middle-age population (<45 years), whereas Anaplastic astrocytoma, GBM and Oligodendroglioma showed incidence after 45 years of age.CT accurately characterized 42 of the total 50 cases. Diagnostic accuracy of CT in characterizing Meningioma, Pilocytic astrocytoma, Craniopharyngioma, Oligodendroglioma and pituitary adenomas was better than anaplastic astrocytoma and glioblastoma multiforme. Glioma mostly presented as hypo-dense lesion in NCCT while majority of Meningioma were hyper dense.Necrosis was seen in metastasis and GBM. Calcifications were seen in meningioma, craniopharyngioma and oligodendroglioma **Conclusion**: Supratentorial tumours can be seen in pediatric age group as well as in adults and elderly population. Glioma was the most common supratentorial brain tumour followed by meningioma and metastases. CT features are fairly characteristic in meningioma, craniopharyngioma and pituitary adenoma with overlap of imaging features in anaplastic astrocytoma, GBM and solitary metastasis.

Keywords: Supratentorial tumours, Computed tomography, Glioma, Central nervous system.

INTRODUCTION

C.N.S. neoplasms are the sixth most common tumours in adults with average incidence of 5-6/100,000 population.[1] In children, the incidence is still higher second only to neoplasm of the hematopoietic system. Since majority of the tumour present with non-specific complaints such as a headache, strokes like syndrome or seizure, often a diagnosis is made or suggested by findings on initial imaging studies like computed tomography (CT). CT and MRI are basic imaging techniques.[2] The patients with neurological symptoms may go with this imaging techniques to get the initial confirmation.[3]

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Computed tomography will provide the added information about calcification/ Haemorrhage which may help to narrow down the differential diagnosis. All these features of CT can identify the location of lesion perfectly.[4] It plays a vital role in detection, localization and characterization of the tumour and shows its secondary effects (hemorrhage, edema, mass effect and herniation) in great details.

CNS neoplasm can be classified in various ways depending upon location (topographical i.e. supratentorial or infratentorial),[5] extra or intra-axial. Further classification is based on histological characteristics. Both location and histology are important determinants of clinical presentation and prognosis. In adults, supratentorial tumours outnumber posterior fossa tumours by a ratio of 7:3 but in children, this ratio is reversed.[1] But the other study observations revealed that supratentorial tumours were more often than the infratentorial tumours in children.[6,7]

CT evaluation of brain tumours is relatively non-invasive therefore easily and rapidly accomplished. CT provides a sensitive and reproducible method for evaluating suspected tumour in brain.[8] Even though magnetic resonance imaging (MRI) is more sensitive imaging in detecting the brain metastases than the computed tomography (CT). CT plays an important role in the initial stage detection and preoperative management.[3,9]

MRI along with its newer advanced techniques like MR perfusion and MR spectroscopy has been established as current modality of choice in characterization of brain tumours and scores over CT

in many aspects.[10] However, CT is still used in evaluation of brain tumours in critically ill patients, when MRI is contraindicated, and also in economically poor population where cost factor and nonavailability of MRI is a major factor of constraint. CT has the advantage of wider availability, being less expensive than MRI and showing calcification in greater details.[11,12] Much faster acquisition capability of current CT units is most helpful in patients who are critically ill or medically unstable.

Our study discussed Computed tomography imaging extensively and its features in supratentorial brain tumours also discussed by the study.

MATERIAL AND METHODS

The present study included 50 cases of supratentorial brain neoplasms detected on CT imaging belonging to different age group between the periods from December 2013 to September 2015.

All the subjects underwent plain CT and contrast-enhanced CT (NCCT& CECT). CECT was done following 40 ml intravenous administration of iodinated contrast.

Diagnosis of the lesions with respect to its anatomical location and characterization and secondary effects to tumour like edema, mass effect, herniation, hydrocephalus were evaluated.

NCCT and CECT imaging findings were correlated with postoperative surgical and histopathological findings. The postoperative histopathological diagnosis was considered as gold standard.

Statistical Analysis

Pathological diagnosis considered as primary outcome variable. Features of CT like hypodense, isodense, hyperdense, necrosis, calcifications and enhancement pattern etc., were considered as primary explanatory variables and age was considered as other explanatory variable.

Descriptive analysis was carried out by frequency and proportion for categorical variables. Data was also represented using appropriate diagrams like bar diagram, pie diagram and box plots.

RESULTS

A total of 50 cases included in the final study. Among them, majority of the supratentorial brain tumours (46%) were seen in 16-45 age group and the proportion of tumours in 46-60 years age group was 34%. The proportion of below 15 yrs and above 60 yrs was 8% and 12% respectively. [Figure 1]

38% of the tumours were hypo dense on CT. whereas equal proportion of the tumours were isodense and hyper dense (32% each). Cystic/ necrotic changes were seen in as high as 56% of the tumours. Calcification was noted in 28% of the tumours. There were 40% of the lesions with mild to moderate enhancement with marked enhancement seen in 42%.The majority of the lesions were Glioma. Whereas the proportion of Craniopharyngioma, Meningioma, metastatic and pituitary adenoma were, 8%, 18%, 16% and 10% respectively. The majority of the histopathological diagnosis (22%) contributed by Glioblastoma multiforme whereas the proportion of other glioma types like pilocytic astrocytoma, diffuse low-grade glioma, oligodendroglioma, anaplastic astrocytoma was 4%, 6%, 6% and 12% respectively. metastasis and meningioma contributed 14% and 18% respectively. The proportion of pituitary adenoma and craniopharyngioma was 8% and 10% respectively. [Table 1]

Among all the radiological diagnosis Glioma contributed more proportion in all age groups but in 16-45 years age group Glioma was the most common tumour type (43.47%), followed by Meningioma (30.43%). In 46-60 years age group Glioma and metastasis were common, 52.94% and 29.41% respectively. [Table 2] Pilocyticastrocytoma and low-grade Glioma were was seen in younger population (< 45 yrs), whereas anaplastic astrocytoma, GBM and oligodendroglioma showed incidence after 45 yrs of age in our study.[Figure 2]

CT accurately characterized 42 of the total 50 cases with sensitivity of 84% and specificity of 86%. Diagnostic accuracy of CT in characterizing Meningioma, Pilocytic astrocytoma, Craniopharyngioma, Oligodendroglioma and pituitary adenomas approached 100% in our study. Whereas, diagnostic accuracy was least in characterizing Anaplastic astrocytoma followed by Glioblastoma multiforme. Two lesions which were incorrectly characterized as Anaplastic astrocytoma in our study turned out to be GBM on histopathology. Out of the three lesions incorrectly characterized as GBM, two were proven to be anaplastic astrocytoma and one to be metastasis on histopathology. Two lesions incorrectly characterized as metastasis were diagnosed as GBM on histopathology.[Table 3]

Glioma (16 / 25 cases) mostly presented as hypo-dense lesion in NCCT while majority of Meningioma were hyper dense. The majority of the Glioma showed variable degree of enhancement in CECT (22 / 25 cases). Necrosis was frequently detected in metastatic lesion (5 / 7 cases).Majority of metastatic lesions and Meningioma were intensely enhancing on CECT. All the 11 cases of GBM showed necrotic areas within the mass. All the four cases (100%) of Craniopharyngioma showed calcifications. The incidence of calcifications in Meningioma was 45%in our study. All the three of the Glioma (3/ 25) showing calcifications were Oligodendroglioma.[Table 4]

Non-enhancing tumours were invariably low-grade Glioma. The majority of the GBM s showed strong enhancement (80%). Mild to moderate enhancement was a nonspecific feature with some percentage of

all the tumour types showing this type of enhancement pattern [Figure 3].

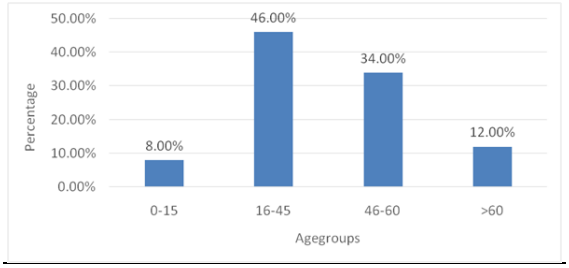

Figure 1: Bar chart of Age groups distribution in study group (N=50).

Table 1: Descriptive analysis of Different parameters in study group (N=50).

Parameter	Frequency	Percentage
I. CT features		
Hypo dense	19	38%
Isodense	16	32%
Hyper dense	16	32%
Cystic /necrotic areas	28	56%
Calcification	14	28%
Mild to moderate enhancement	20	40%
Marked enhancement	21	42%
II. Radiological Diagnosis		
Craniopharyngioma	4	8.00%
Pituitary adenoma	5	10.00%
Metastasis	8	16.00%
Meningioma	9	18.00%
Glioma	24	48.00%
III.Pathological diagnosis		
Glioma		
Pilocytic astrocytoma	2	4.00%
Diffuse low-grade Glioma	3	6.00%
Oligodendroglioma	3	6.00%
Anaplastic astrocytoma	6	12.00%
Glioblastoma multiforme	11	22.00%
Craniopharyngioma	4	8.00%
Pituitary adenoma	5	10.00%
Metastasis	7	14.00%
Meningioma	9	18.00%

Table 2: Association of Age groups with radiological diagnosis in study group (N=50).

Age groups	Radiological Diagnosis				
	Craniopharyngioma	Glioma	Meningioma	Metastasis	Pituitary adenoma
0-15	2 (50%)	2 (50%)	0 (0%)	0 (0%)	0 (0%)
16-45	2 (8.695%)	10 (43.47%)	7 (30.43%)	0 (0%)	4 (17.39%)
46-60	0 (0%)	9 (52.94%)	2 (11.76%)	5 (29.41%)	1 (5.882%)
>60	0 (0%)	3 (50%)	0 (0%)	3 (50%)	0 (0%)

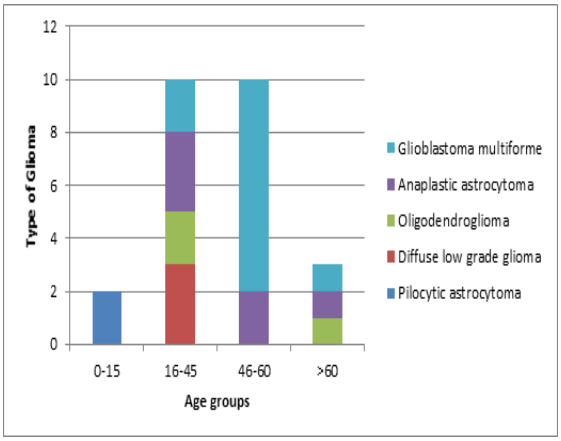

Figure 2: Age distribution of various types of Glioma in study population (N=25).

Table 3: Correlation of radiological and histopathological diagnosis in study population (N=50).

Type of tumour	No. of tumours on CT	No. of tumours on final histopathological diagnosis	Total number of true positives on CT
Meningioma	9	9	9 (100%)
Diffuse low-grade Glioma	4	3	3 (100%)
Pilocyticastrocytomas	2	2	2 (100%)
Glioblastoma multiforme	10	11	7 (63.64%)
Craniopharyngioma	4	4	4 (100%)
Anaplastic astrocytoma	5	6	3 (50%)
Oligodendroglioma	3	3	3 (100%)
Pituitary adenoma	5	5	5 (100%)
Metastasis	8	7	6 (85.71%)
Total cases	50	50	42

Table 4: CT features in study population (N=50).

Tumour	Total no. of histopathological proven cases	Density			Enhancement			Areas of cystic necrotic change	Calcification
		Hypo	Iso	Hyperx	None	Mild to moderate	Strong		
Glioma	25	16	5	4	3	8	14	15	3
Metastasis	7	3	1	3		2	5	5	
Craniopharyngioma	4	1	3			4		4	4
Meningioma	9		2	7		2	7	3	4
Pituitary adenoma	5		2	3	1	4		2	1

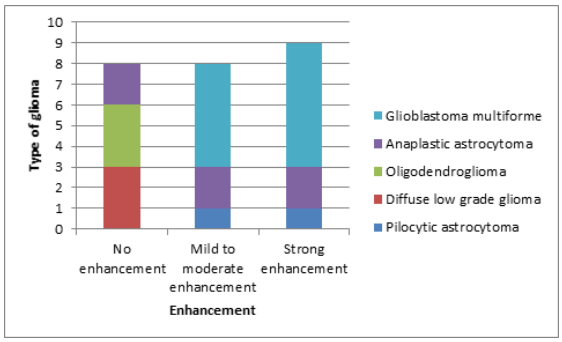

Figure 3: Enhancement characteristics of various types of Glioma in study population (N=25).

DISCUSSION

Singh, H., et al. reported that the adult age group 30-65 years was most commonly affected by Supratentorial tumours (especially gliomas). In children also gliomas can occur in the age group 1-4 years mostly. 31-40 years age group was mostly affected with 33.3% incidence of tumours and 23.8% incidence was present in 61-60 years age group.[10,13] The similar results were observed in the present study as majority of the supratentorial brain tumours (46%) were seen in 16-45 age group and the proportion of tumours in 46-60 years age group was 34%. The proportion of below 15 yrs and above 60 yrs was 8% and 12% respectively.

Out of 50 cases of the supratentorial brain tumours50% were Glioma (25 cases).The present observation correlates well with the study involving a large group, by Baker et al in 1980in which Glioma was the commonest primary supratentorial tumour (50.2%).[8] Glioma mostly presented as hypodense lesion in NCCT and majority of them showed variable degree of enhancement on CECT, (22/25cases).

Next common primary supratentorialtumour in the studied group was meningioma accounting for 18% of all primary supratentorial brain tumours. The majority of meningioma were hyperdense and showed intense homogeneous enhancement (77.8%). Around 44.4% of meningioma showed calcification, cystic change was seen in 40% meningioma. The majority of meningioma (90%) were associated with vasogenic edema of variable degree. All these findings correlate with earlier studies by Rohringer (1989) and Smirinotopolous (2000).[14,15]

Next common supratentorial tumours in the studied group were of metastatic origin accounting for 16% of cases. The incidence is lower as compared to earlier studies by Baker et al (1980) who reported a higher incidence of about 30%. The lower incidence in the present study could be because of inclusion of only supratentorial masses.

The metastatic lesions in this study were iso to hypodense (62.5%) and showed intense contrast enhancement (75%). 75% of metastases showed cystic and necrotic changes. Most of the metastases were multiple (75%). The present observation is similar to that of Potts (1980), JS Nelson and Von Daimiling in 200.[16,17]

The incidence of pituitary adenoma was 10% in the current study. About 80% of macro-adenoma showed mild to moderate enhancement and 40% showed cystic/necrotic changes.Two macro-adenomas showed supra-sellar and para-sellar extensions.

The incidence of Craniopharyngioma in this study was 8% of all supratentorial tumours. Craniopharyngioma detected in child shows cystic component and peripheral calcification whereas adult variety showed heavy calcification which is seen only in 50% adult Craniopharyngioma. Similar findings have been reported in an extensive study on Craniopharyngioma done by Crotty and Young (1995).[18]

In the present study glioma was commonest supratentorial neoplasm (50%). Out of 25 cases 11cases (45%) were glioblastoma multiforme,6 were Anaplastic astrocytomas. Rees in 1996 also reported glioblastoma to be most common primary malignant tumour of adulthood, Walker MD et al in 1975 in a behalf of American cancer society reported GBM incidence as high as 50% of all intracranial glioma.[19] In the current study majority of GBM were hypodense and all showed necrosis and intense enhancement of the solid portion of the tumour. Also, most GBM were unifocal and singular in presentation mostly located in deep supratentorial hemispheric white matter. Most cases were associated with extensive perilesional edema and mass effect

Oligodendroglioma incidence in present study was 6% of all supratentorialtumour and 12.5% of all glioma. The majority of them showed calcification. Most were located in frontal lobe. CT characteristics of this subtype were similar to those reported by Vonofakos (1979).[20]

All the three low-grade gliomas were hypodense and majority was non-enhancing and did not have associated edema. All were located in supratentorial white matter of frontal/temporal/parietal lobe. Similar findings have been reported by NE Leeds and Elkincus (1984).[21] According to Singh, H., et al. there was majority (81%) lesions showed hypo dense as CT feature and 26.2% of the cases with no enhancement in CT imaging. More or less similar results observed in our study as 38% of the tumours were hypo dense on CT. Whereas equal proportion of the tumours were isodense and hyper dense (32% each). There were 40% of the lesions with mild to moderate enhancement with marked enhancement seen in 42%.

CT accurately characterized 42 of the total 50 cases with sensitivity of 84% and specificity of 86%. The diagnostic accuracy of CT in characterizing

meningioma, pilocytic astrocytoma, craniopharyngioma, oligodendroglioma, and pituitary adenomas approached 100% in our study. Whereas, diagnostic accuracy was least in characterizing anaplastic astrocytoma followed by glioblastoma multiforme. This could be because of the higher incidence of these lesions compared to other types of brain tumours.

Two lesions which were incorrectly characterized as anaplastic astrocytoma in our study turned out to be GBM on histopathology. Relatively less enhancement and necrotic changes were the reason for falsely characterizing the above lesions.

Out of the three lesions incorrectly characterized as GBM, two were proven to be anaplastic astrocytoma and one to be metastasis on histopathology. Two lesions incorrectly characterized as metastasis were diagnosed as GBM on histopathology. Overall there is overlap in the imaging features of Anaplastic astrocytoma, GBM and metastasis. The multiplicity of the lesions aids in the diagnosis of metastasis in majority of cases (75%). In cases of solitary metastasis it is difficult to differentiate from GBM based only on CT features.

Singh, H., et al. discussed the occurrence of gliomas as 39.6% of the total 106 cases confirmed as gliomas and other primary tumours contributed 32%. The histopathological findings revealed that Low-grade astrocytoma occupied top proportion with 31% then followed gliblastoma multiforme with 28.6%.[10,22] Our study findings showed similar results as the majority of the histopathological diagnosis (22%) contributed by Glioblastoma multi forme whereas the proportion of other Glioma types like Pilocytic astrocytoma, Diffuse low-grade Glioma, Oligodendroglioma, Anaplastic astrocytoma was 4%, 6%,6% and 12% respectively. Metastasis and Meningioma contributed 14% and 18% respectively. The proportion of Pituitary adenoma and Craniopharyngioma was 8% and 10% respectively.

Overall sensitivity (84%) and specificity (86%) of CT in characterizing various brain tumours is less compared to the reported sensitivity and specificity of MRI. In all cases of supratentorial tumours included in the present study, CT was able to demonstrate the lesion with respect to its location and other associated findings such as edema, mass effect, intratumoral bleed, necrosis, calcification and basing on those characteristics.

CONCLUSION

Supratentorial tumours can be seen in pediatric age group as well as in adults and elderly population. The incidence of supratentorialtumours rises after the age of 40. Glioma was the most common supratentorial brain tumour followed by meningioma and metastases. CT features are fairly characteristic in meningioma, craniopharyngioma and pituitary adenoma with overlap of imaging features in anaplastic astrocytoma, GBM and solitary metastasis. It is important to provide the better information about the features of tumours to give the best choice of treatment for the patients.

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The role of distraction osteogenesis in management of temporomandibular joint ankylosis.

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- **Author(s):** Yoganandha, R.; Thangavelu, A.; Kumar, S. R. Selva

- **Abstract:** Various treatment protocols have been described for the management of Temporomandibular Joint Ankylosis. Routine management includes release of the joint by surgical resection of the ankylotic mass, with methods to reconstruct the joint and placement of an interpositional material to prevent any recurrence; followed by aggressive physiotherapy. The scope of this article is limited to the correction of secondary aesthetic deformities associated with TMJ ankylosis as a first stage procedure using the principles of distraction osteogenesis, prior to treatment of the functional component (release of ankylosis).

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