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Involvement of Autonomic Nervous System in Young Obese Males and Females

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ABSTRACT

Background: In obesity excessive adipose tissue accumulates and alters the metabolic profile with a variety of adaptations in cardiovascular functions.

Method : 60 obese and 60 non obese healthy young adults aged 18-25 years were selected based on body mass index. Heart rate variability power spectral analysis and hand grip dynamometer tests were done to assess the sympathetic cardiovascular function.

Results: HRV analysis found significantly lower values of TP, HF and significantly higher values of LF and LF/HF ratio among the obese group.

Blood pressure response to an isometric exercise was reduced in obese group.

Conclusion: Our data indicate that obese subjects have decreased parasympathetic activity seen as decrease in HF and increased sympathetic activity seen as increasing in LF and resting BP.

BP response to isometric exercise was impaired in obese subjects due to lower sympathetic activation.

Keywords: *Heart rate variability, Power spectral analysis, Handgrip dynamometer test, Isometric exercise, Low frequency to High frequency.*

BACKGROUND

The magnitude of upswing in overweight and obesity prevalence has been truly astonishing[1]. It has become an important health problem in developing countries like India[2]. Obesity causes cardiovascular, pulmonary, metabolic, orthopaedic, psychosocial disorders. Obese persons suffer from cardiovascular disorders due to either decreased parasympathetic activity or sympathetic activation[3]. ANS plays an important role in regulating energy expenditure and body content[4, 5]. The reason for increased prevalence of cardiovascular diseases in obesity remains obscure. The factors suggested for the causes such as insulin resistance, hypertension, and reduced high density lipoproteins and also due to reduction in autonomic function [6, 7,8,9,10,11]. Heart rate variability measures the effect of autonomic functions on heart so it can be the most useful method to investigate the effect of obesity on cardiovascular disease[12].

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METHOD

The study was approved by Ethical Committee.

Present study was conducted in the Department of Physiology, Kamineni Academy of Medical Sciences and Research Centre, L. B. Nagar, Hyderabad. 60 obese (30 males and 30 females) and 60 non obese (30 males and 30 females) healthy young adults aged 18-25 years were selected based on body mass index.

Inclusion Criteria:

- Young obese males and females aged 18-25

years.

• They should maintain good health recommended for that age, as evaluated by general physical examination without any known respiratory, cardiovascular illness, or any disorder which can interfere the autonomic responses.

Exclusion Criteria:

• Age below 18 years and above 25 years.

• Subjects with the history of asthma, diabetes mellitus, hypertension, other cardiovascular diseases and endocrine diseases.

The benchmark for obesity was taken on the basis of body mass index as per the standard protocol. Height (m) and weight (kg) of the subjects will be recorded and BMI calculated as per Quetelet's index.

Weight (kg)

Body mass index = Height^2 (m)

Subjects were classified into two groups based on BMI.

Normal weight – BMI- 18.5-24.99 kg/m^2

And / obese – BMI > 30 kg/m^2.

The protocol was explained and informed consent was obtained from each of the participant. The subject was asked to relax in supine position for 30 minutes in the laboratory and then the autonomic function tests were performed on the subjects.

The body weight of the subjects was measured using a pedestal type of weighing scale with a maximum capacity of 150 kg. The body weight was considered to the nearest of 0.1 kg. Height without footwear was measured using a vertical scale (Avery, India) with an accuracy 0.5 cms and was rounded to the nearest 0.01 m.

To assess autonomic (sympathetic and parasympathetic) cardiovascular parameters.

1. Power spectral analysis of heart rate variability.
2. Handgrip dynamometer test.

Power spectral analysis of heart rate variability:

Frequency domain analysis was done by using Niviqure software (Niviqure Meditech pvt. Ltd). Heart rate variability analysis was assessed by spectral analysis of series of successive R-R intervals (frequency domain analysis) on 5 min ECG recording.

The heart rate power spectrum is typically divided into two frequency bands. Low (0.04-0.15Hz) and high (0.15 to 0.4 Hz). The high frequency region is considered as a marker of vagal activity where as the low frequency component is influenced by both sympathetic and vagal activity.

Handgrip dynamometer test: It was performed to elicit sympathetic cardiovascular functions during the isometric exercise. The results were noted down.

RESULTS

The results obtained were expressed as mean ± standard deviation and were tabulated.

DISCUSSION

The main goal of the study was to detect changes in autonomic cardiovascular regulation in healthy obese young adult male and females in the age group of 18-25 years and compared the results with the age and sex matched healthy non obese controls.

Power spectral analysis of heart rate variability: our study found a statistically significant decrease in TP, LF, HF, HF (nu) and increasing in LF (nu) and LF/HF in obese males compared with the non- obese males. Similar findings were noticed in females also.

Our study findings are similar to that of Laederack-Hofmann K et al [3] , Nagai N et al [4] , Muscelli E et al [9], Hirsch J et al [12], Poirier P et al [13], Karason K et al [14], Amano M et al [15] , Gulzar JM et al[16] .

The RR interval variations present during resting conditions represent a fine tuning of the beat to beat control mechanism. An understanding of modulator effects of neural mechanisms on sinus node has been enhanced by spectral analysis of HRV. The efferent vagal activity is a major contributor to the HF component, as observed in clinical and experimental observations of autonomic manoeuvres. More controversial is the interpretation of the LF component, which is considered as a marker of sympathetic modulation (when expressed in normalised unites) by some and others as a parameter of both sympathetic as well as vagal influence. This discrepancy is due to the fact that in some conditions associated with sympathetic excitation, a decrease in the absolute power of the LF component is observed. It is important to recall that during sympathetic activation the tachycardia is usually accompanied by a marked

reduction in total power, whereas the reserve occurs during vagal activation. When the spectral components are expressed in absolute units (milliseconds squared), the changes in total power influence LF and HF in the same direction and prevent the appreciation of the fractional distribution of the energy.

It is important to note that HRV measures fluctuations in autonomic inputs to the heart rather than the mean level of autonomic inputs. Thus, both autonomic with drawl and saturating high level of sympathetic input lead to diminished HRV [17].

The mechanism underlying the change of parasympathetic and the sympathetic activity in overweight is unknown. Several hormonal signals have been postulated. These include insulin, which has been shown in humans to increase sympathetic activity during euglycemic insulin camp; free fatty acids have been shown to increase BP in rats by stimulation of excitatory hepatic afferent nerves and leptin, the ob gene product, which has been shown to increase sympathetic discharge to several tissues in rats, and has been found elevated during rapid weight gain in humans [18].

Hand grip dynamometer test:

Our study results indicate high baseline systolic and diastolic blood pressure in obese males and females when compared with non obese males and females. After the exercise the diastolic blood pressure in obese males and female's results were significantly lesser than non obese males and females.

Our results are correlated with earlier reports by Nageswari K S et al [19,] Valensi P et al [20], Colak R et al [21], Akhter S[22].

The high baseline blood pressure in obese group may be due to higher vasoconstrictor tone and increase in the cardiac output due to increase circulatory load on heart as a consequence of increase in body mass index.

The lower blood pressure response to isometric exercise in the obese group is due to either a lower sympathetic activation or increase in peripheral vascular resistances in response to a normal or subnormal sympathetic stimulation [20].

CONCLUSION

Our study concludes increase in body weight is associated with an increase in systolic and diastolic blood pressure in both males and females at resting condition, when compared with age and sex matched with normal weight controls. Low frequency power when expressed in normalised units is increased in obese males and females when compared with controls indicating that there is an increase in the cardiac sympathetic activity at resting condition in obese subjects. High frequency power expressed in both absolute units (ms^2) and in normalised units is decreased in obese males and females when compared with controls indicating there is decrease in the parasympathetic activity at resting condition in obese subjects.

Low frequency to High frequency power ratio increased in obese males and females when compared with controls indicating there is sympatho-vagal imbalance in obese subjects.

Blood pressure response to isometric exercise using hand grip dynamometer is lowered in obese males and females when compared with controls indicating lower sympathetic activation.

Though there is an increase in resting sympathetic activity in obese males and females as evidenced by increase in baseline blood pressure and LF (n.u) component of HRV, but the sympathetic response after isometric exercise is reduced in obese males and females.

Source of Funding- Self

Conflict of Interest - Autonomic Nervous System

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The Study to Compare Denver 1 and Trivandrum Developmental Screening Charts in Children between 0-3 years and to Assess Developmental Delay at Various Age

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ABSTRACT

Objective: To develop and validate a simple screening tool for identifying developmental delay among children of 0-3 years of age in the community.

Method: 100 children from 0-3 Years of age were randomly taken from paediatric opd and screened using TDSC against DDST as a reference standard.

Results : When one item delay in TDSC (0–3 y) was considered as 'TDSC delay' (test positive), the sensitivity and specificity of TDSC (0–3y) was found to be 83.33% and 91.49% respectively with a Negative Predictive Value of 98.85% and odds ratio of 53.75% with p value 0.0006.

Conclusions : TDSC (0–3y) is a simple, reliable and valid screening tool for identify children between 0 and 3 y with developmental delay, enabling early intervention practices.

Keywords : *Development, TDSC, Delay.*

INTRODUNCTION

Child development is an intuition and self evident idea that gives meaning to changes in childrens physical, cognitive, psychosocial and moral development. Development is a telelogical concept that must have a specific direction and an end. The later stages of development are better and more comprehensive than early stages[1]. According to Baldwin nature governed and directed these developmental process towards truth, beauty and goodness.

The term developmental delay is used, when a child's development lags behind established normal ranges (norms) for his or her age in areas of motor, cognitive, language, behavioral, emotional, or social development.

Global developmental delay is defined as a delay in two or more developmental domains. Early detection of developmental delay is important for instituting community based intervention programs as early as possible, in an effort to prevent onward progression to disability.

In addition to delays in development, physicians should also recognize deviations in development. Deviance occurs when a child develops milestones or skills outside the typical acquisition sequence.

Developmental dissociations may also occur. Dissociations arise when a child has widely differing rates of development in different developmental domains.

Regression is when a child loses previously acquired skills or milestones, and although less common than the other patterns, should cause the greatest concern since it is often associated with serious neurological and inherited metabolic disorders.

The prevalence of developmental delay in the general population in India is as high as 1.4 to 2.4 %, among children under 3 y of age [2]. However, the mean age at which these children attend early intervention, that maximizes development of the child, is 4 y [3].

Early identification of children with delayed development has important implications for their treatment and in preventing risks of future disabilities and secondary problems related to family dysfunction, peer difficulties, and school failure Evidence supports that early treatment of developmental disorders leads to improved outcomes for children and reduced costs to society

Developmental screening is a brief testing procedure designed to identify unsuspected deviations from normal development that would not otherwise be identified in routine practice. The goal of screening is to identify, as early as possible, developmental disabilities in children at high risk so that a treatment or remediation can be initiated at an early age when it is most effective[4-6]. Early screening does not merely mean the administration of a single test at one point of time, rather it is a set of processes and procedures used over a period of time [7].

The American Academy of Pediatrics (AAP) describes "good" screening tools as those with sensitivity and specificity in the 70-80% range[9]. Screening tools can assist in identifying at-risk children; however, they do not provide diagnoses. When a child passes a screening test it provides an opportunity to promote developmentally appropriate activities and discuss age appropriate milestones

Early treatment of both developmental and behavioral problems is less costly than treatment for long standing, fully developed disorders and it also improves the quality of life for both the child and family.

The three approaches to screening include informal, routine and focussed developmental screening [8].

1. Informal screening is based on observing the child during a routine pediatric check up and asking parents about their concerns about child's development.

2. Routine formal screening entails systematic developmental screening of all children with the help of standardized screening instruments

3. Focussed screening involves developmental screening of the following groups of children:

(a) Children whose parents express developmental concerns or in whom teachers and physicians suspect problems.

(b) Newborns with conditions that have known to have high risk for developmental delay.

It is recommended that screening test should be simple, brief, convenient to use, cover all areas of development, have adequate construct validity, be applicable to a wide age range, and have referral criteria that are both specific and sensitive[7] .

Commonly used screening tests:

1. DDST1
2. DENVER2
3. Clinical Linguistic Audiotory Milestone Scale (CALMS)
4. Early Language Milestone Scale (ELM)
5. Phatak's Baroda Screening Test
6. Trivandrum Developmental Screening Chart (TDSC
7. Language Evaluation Scale Trivandrum (LEST).
8. Nursey Evaluation Scale Trivandrum (NEST)
9. Bayley Scale of Infant Development
10 Development Assesment Scale for Indian Infants (DASII)
11. Development Assesment Tool for Anganiwadis (DATA)

DDST is the most widely used test for screening developmental problems in children. The tests cover four general functions: Personal social, fine motor adaptive, language, and gross motor. DDST II is a revision and update of the Denver Developmental Screening Test.It is designed for use by the clinician /teacher, or other early childhood professional to monitor the development of infants and preschool-aged children.

TDSC for children of 0-6 y was designed and developed at the Child

Development Centre, Government Medical College Campus, Thiruvananthpuram by Dr MKC Nair

The prevalence of developmental delay in general population is 1.4-2.4% in under 3 years of children

Early identifying and early intervention maximizes the development in these children. TDSC is simple chart containing 27 items. Anganwadi worker can screen children less than 3 years and refer them to pediatrician if there is any developmental delay.

Objectives-

1.Comparison of denver 1 and trivandrum development screening charts in the age group of 0-3 years.

2. To assess developmental delay at various age group using TDSC.

Methadology

Type of study: cross sectional study.

This study was conducted in association with st.sebastian's hospital cherupuzha kannur .

Source of population: children (0-3Y) attending to pediatric OPD are enrolled for the study

Exclusion criteria: Children who are very sick.

Sample size: A total of 100 children .

Informed consent taken from parents.

Tools

1.DDST1

2.TDSC.

DATA COLLECTION PROCEDURE;

Data collection is done by two persons.

TDSC which is a simple chart done by trained nursing staff

And DDST is done myself.

Then a line is to be drawn vertically through the chronological age of the child marked the tool. The items with upper limit ending to the left of the line are expected to be attained by the child normally.

If any item is not attained is named as positive/ delayed for that child and chart.

The milestones falling on the left side of vertical line from top, if attained is named as negative/ normal for that child and chart.

Outcome variable: To detect delayed milestones.

RESULT

A total of 100 children who are visiting pediatric opd were initially selected for screening using both TDSC and DDST by two different individuals.

In 100 children there were 46 boys and 54 girls(0-3years).

Sensitivity is the proportion of patients *with* disease who test positive. sensititvity: = TP / (TP+FN).

Specificity is the proportion of patients *without* disease who test negative. specificity= TN / (TN + FP).

Pretest Probability is the estimated likelihood of disease before the test is done. If a defined population of patients is being evaluated, the pretest probability is equal to the **prevalence** of disease in the population. It is the proportion of total patients who have the disease. prevalence = (TP+FN) / (TP+FP+TN+FN).

Sensitivity and specificity describe how well the test discriminates between patients with and without disease. They address a different question than we want answered when evaluating a patient, however. What we usually want to know is: given a certain test result, what is the probability of disease? This is the **predictive value** of the test.

Predictive value of a positive test is the proportion of patients with *positive* tests who have disease. Predictive value of positive test = TP / (TP+FP).

Predictive value of a negative test is the proportion of patients with *negative* tests who *do not* have disease. Predictive value of negative test = TN / (TN+FN). It measures how well the test rules out disease.

Cross tabulation using DDST and TDSC is shown in table 2.There were 5 true positive and 86 true negative cases, out of 100 cases ,8 cases were false positive and 1 case false negative

Odds ratio:

Its calculated by using formula=ad/bc

Cases with delay outcome(true positive)- a=5

False positive B=1

False negative c=8

Cases without delay (true negative)- d=86

Odds ratio is 53.75%(95%cl:5.57-518)

ZStatistic – 3.446

P value- 0.0006

Table 4 shows test characterstics with delay at various age ranges. High sensitivity is seen in 0-12 months and 25-36months with an average specificity 80%.In age group of 13-24 months sensitivity is 66% where as specificity is 91%. Standard for good screening

tool is 70-80% sensitivity and specificity close to 80%.

Our study shows sensitivity of 83.33% and specificity of 91.4%and positive predictive value of 38.46% and negative predictive value of 98.85%.

Odds ratio of our study is 53.75 and P value is 0.0006 which is statistically significant. Since TDSC was developed as a screening tool for developmental delay, negative predictive value is 98.85% with a sensitivity of 83.33% is a good screening tool.

A screening test should ideally be one with high sensitivity, high negative predictive value and not having much compromise on specificity.TDSC tool has a very high and acceptable reliability. The prevalance of delay is 2.63%, 7.69 & 8.9% In age group of 0-1yrs, 1-2yrs , 2-3yrs.

DISCUSSION

A screening test should ideally be one with high sensitivity and specificity. It should be less expensive, easy to do, & less time consuming. Some children assessed as delay in screening test might not be delayed when assessed with standard screening test. This error is called false positive. And on other hand some are not delayed in screening test but are actually delayed with standard test. This error is false negative. The first type of error leads to over referral for critical evaluation, taxing, expert with work load, parents with anxiety, & more visit to experts. The second type of error leads to under referrals & health workers, parents willnot take concern but actually they needs attention(10).In our studt the sensitivity is & specificity is

Child with developmental delay receives intensive and well designed timely intervention improves the prospectus and quality of life . As many studies shows early the intervention better is the outcome. Therefore identification of developmental delay in children at early age, even in infancy if possible is advocated.

TDSC is a simple chart containing 27 items. An anganwadi worker/ANM/nurse/paramedical staff can be trained and use TDSC in 10 min at low cost. It requires a simple training and TDS chart.

Presence study having overall sensitivity of 83.33% and specificity of 91.4% with positive predictive value of 38.4% and negative predictive value of 98.8%.

The Positive Predictive Value obtained for this selection(one item delay) was only 30 % even though a high Positive Predictive Value was expected in a situation where the specificity was relatively good (90.8%). This Positive Predictive Value is explained and justified by the relatively large numbers of normal (93.6 %) and the low prevalence (4.4 %) of developmental delay, in the sample studied.

Advantage of TDSC are being cost effective and simple which can be used to screen children in large scale at community level. But a large community based study is needed to validate TDSC to implement as a screening tool. MK Nair et al in his study showed that TDSC is 66.8% sensitive & 78.8% specificity when compared with DDST.

In phatak at al the study of Baroda development screening test was done on infant with sensitivity and specificity above 65% and lesser over referrals when compared with Baroda norms.II.

CONCLUSION

TDSC (0–3 y) is a simple, convenient and valid screening tool, for identifying children of 0–3 y with developmental delay in the community. This is a tool, which can be done in 5 min, by a health worker, requires, apart from the tool, a pen/pencil and some preliminary training to apply the tool.

This helps in community intervention programs and if needed refer the child at the earliest for appropriate intervention to a nearby referral centre. This tool is not for assessing the developmental age of the child and also not for a specific diagnosis of a developmental delay/ disability.

TDSC is more sensitive than specific useful for screening purpose with high negative predictive value can be used as a screening toll in detecting developmental delay.

LIMITATION

This study had certain limitations like

1. Sample size is very small.

2. Being a hospital based study, in our study children 0-3yr were screened in hospital by two persons using 2 separate charts.

3. Imperfect reference standard and non availability of perfect reference standard for developmental delay for this entire age group.

Table1: Age and sex distribution of the sample

Age	frequency	Percent
0-12 month	39	39%
13-24 month	38	38%
25-36 month	23	23%
Total	**100**	**Boys-46% Girls -54%**

Table 2: Cross tabulation of TDSC(0-3Y) against DDST.

DDST

TDSC	Delayed	Normal	Total
Delayed	5(a)	1(b)	6
Normal	8(c)	86(d)	94
Total	**13**	**87**	**100**

Table 3: RESULTS of TDSC

Sensitivity	83.33%
Specificity	91.49%
Positive predictive value	38.46%
Negative predictive value	98.85%
Likelihood ratio positive	9.79%
Likelihood ratio negative	0.18%
Prevalence	6%

Table 4: Test characterstics with delay at various age ranges using TDSC

	0-12 months	13-24 months	25-36 months
Sensitivity	100%	66.6%	100%
Specificity	94.6%	91.6%	85.7%
Positive predictive value	33.33%	40%	40%
Negative predictive value	100%	97.6%	100%
Likelihood ratio positive	18.5%	8%	7%
Likelihood ratio negative	0	0.36%	0
Prevalance	2.63%	7.69%	8.7%

Source of Funding – Self

Conflit of Interest- Nil

Ethical Committee Clearance – taken from St Sebastain Hospital and KVG Medical College, Sullia.

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Effect of Type 2 Diabetes on Autonomic Function in a Rural Population

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ABSTRACT

Aim: To study the effect of type 2 diabetes on parasympathetic and sympathetic reactivity test in a rural diabetic population.

Material and Method: 50 type 2 diabetics and 50 healthy controls were chosen for the study. Parasympathetic reactivity test was done using 30:15 ratio and Sympathetic reactivity test was assessed using Cold pressor test.

Result: We observed a decreased response in 30:15 ratio in diabetics indicating decrease in the parasympathetic activity. Decreased response in DBP in response to the cold pressure test was observed indicating a decrease in the Sympathetic activity.

Conclusion: In diabetes group significant blunting was seen in the arterial blood pressure response to cold pressor test showing dysfunction in sympathetic activity. Standing test showed highly significant difference between diabetes and control groups indicating parasympathetic dysfunction.

Keyword: *Parasympathetic Reactivity test, Sympathetic Reactivity test, Autonomic function.*

INTRODUCTION

The term diabetes mellitus describes a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion and or insulin action.[1] Diabetes mellitus is a leading public health care problem in developing and developed world, with increasing incidence and long-term complications.

The impacts of T2DM are considerable: as a lifelong disease, it increases morbidity and mortality and decreases the quality of life.[2] At the same time, the disease and its complications cause a heavy economic burden for diabetic patients themselves, their families and the society.

Diabetes mellitus (DM) is well known for chronic complications particularly the triad of neuropathy, retinopathy, and nephropathy, which have a close correlation with the metabolic abnormalities characteristic of diabetes. Diabetic neuropathy is one of the common complications of diabetes and specifically autonomic neuropathy can affect several systems with clinical manifestations of dysautonomy being more common in the cardiovascular, genitourinary, gastrointestinal, and thermoregulatory systems.[3] Diabetic autonomic neuropathy (DAN) frequently coexists with other peripheral neuropathies and other diabetic complications, but DAN may be isolated, frequently preceding the detection of other complications. Despite its relationship to an increased risk of cardiovascular mortality and its association with multiple symptoms and impairments,[4] the significance of DAN has not been fully appreciated.

Neuropathy – especially autonomic neuropathy – is the most common complication of diabetes which is not investigated so frequently. One of the earliest manifestations of diabetic autonomic neuropathy is denervation of the cardiovascular system.[5] Hence assessment of cardiovascular reflexes affords a satisfactory evaluation. The prevalence of autonomic nervous system dysfunction in diabetes is not precisely

known; however, tests of autonomic function have shown impairment in nearly 20 - 30% of diabetic patients.[6] Presence of symptoms along with abnormal cardiovascular function tests suggest poor prognosis and increased incidence of silent myocardial infarction, cardiac arrest, sudden death, and inadequate response to stressful events, e.g., anaesthesia and surgery.[7]

Autonomic dysfunction is common in diabetics and presence of Cardiac Autonomic Neuropathy (CAN) is responsible for silent myocardial infarction and sudden death in diabetics. Hence recognizing cardiac dysautonomia early, which is asymptomatic, will help to delay or arrest its progression.

Autonomic function tests used for assessment of autonomic function are non-invasive and do not require sophisticated equipment. All that is required is an electrocardiogram machine, heart rate monitor and sphygmomanometer. This highlights the importance of simple non-invasive tools in diagnosing asymptomatic cardiac autonomic neuropathy.

So, the following study is directed to show the comparative effects of controlling the sympathetic overactivity by artificially creating a stressful condition using the cold pressor test and of parasympathetic activity by standing test 30:15 RR ratio between asymptomatic T2DM patients and non diabetic control subjects.

AIMS & OBJECTIVE

To compare autonomic function tests between type 2 DM patients and non-diabetic matched controls of Sullia taluk of Dakshina Kannada district.

MATERIAL & METHOD

Hundred subjects between age 40-60 years were selected from the rural population of Sullia who visited KVG Hospital OPD/Ward in Sullia. Study was explained to them and informed consent was taken. A detailed clinical history was taken, using a structured questionnaire which recorded their age, weight, height and history of present or past illness including hypertension, heart disease, diabetes, asthma, cardiovascular risk factor like smoking and family history of diabetes, cardiovascular disease, asthma etc. Two Groups of fifty subjects each were made on which autonomic function tests were performed.

Criteria for selection:

Group 1 was the study group consisting of fifty type 2 diabetes patients as per the WHO criteria where a diabetic is one with "a single raised glucose reading with symptoms, otherwise raised values on two occasions of either Fasting plasma glucose ≥ 7.0 mmol/l (126 mg/dl) or With a glucose tolerance test, two hours after the oral dose of plasma glucose ≥11.1 mmol/l (200 mg/dl).[8]

Group 2 was control group. For this group fifty healthy non diabetic age and gender matched volunteers were selected from the rural population of Sullia.

Both group subjects were not suffering from any illness like hypertension, CKD, Psychiatric disorder, Neurological disease or any other illness which is known to affect Autonomic function. • Not on any medication known to affect autonomic nervous system.

Study design

Autonomic Assessment

Sympathetic reactivity was assessed using Cold Pressor test. Parasympathetic reactivity test was done using 30:15 ratio.

The following tests were performed on both group of subjects.

30:15 Ratio During postural change from lying to standing a characteristic immediate rapid increase in heart rate occur which is maximal at about the 15th beat after standing and is followed by a relative overshoot bradycardia maximal at about the 30th beat. To perform this test the subject is asked to lie quietly on a couch and then to stand up unaided with ECG leads attached. The characteristic heart rate response can be expressed by the 30 : 15 ratio, which is the ratio of the longest R-R interval around the 30th beat after starting to stand up to the shortest R-R interval around the 15th beat. The 30: 15 ratio should be at least 1.04. It was calculated by the following formula:

30:15 ratio = After assuming erect posture R-R interval at beat 30 ÷ R-R interval at beat 15.

Sympathetic Reactivity Test

For this test baseline pulse rate and blood pressure were measured. Then the subject's hand was immersed in cold water, maintained at 4±0.5ºC up to the distal

palmar crease for 2 minutes.[9,10] The subject was asked to relax, breathe quietly and avoid valsalva-like maneuver during the immersion. Blood pressure was measured on the opposite arm at thirty seconds, ninety seconds and 2 minutes during the immersion and one, two, and five minutes during post immersion period. The test result is presented as the difference between the highest diastolic pressure during the examination and the average diastolic pressure at rest.

Statistical Analysis: The data collected was evaluated using appropriate statistical technique: a) Intragroup comparison was done using paired 't' Test. b) Intergroup comparison was done using Students 't' test. c) Adherence to following 'p' value was followed p>0.05: Not significant p<0.05: Significant p<0.01: Highly Significant p<0.001: Very Highly Significant.

OBSERVATION & RESULTS

Table-1: Age and gender distribution of study subjects

Groups	N	Age (Yrs)		Sex	
		Range	Mean ± SD	Male	Female
Diabetes	50	44-60	52.60 ± 3.9	30	20
Control	50	43-60	52.52 ± 3.8	30	20
Significance	**p**	> 0.05, NS		>0.05, NS	

All results are expressed as Mean ± standard deviation, p< 0.05 is significant

Table-2: Physical characteristics of study subjects

Groups	Height (meters)		Weight (Kgs)		BMI (kg/m^2)	
	Range	Mean ± SD	Range	Mean ± SD	Range	Mean± SD
Diabetes	1.57 –1.80	1.73 ± 0.05	52 - 98	66.76 ± 11.11	17.36 – 1.28	22.32 ± 3.33
Control	1.55 –1.83	1.71 ± 0.07	45-110	66.12 ± 11.71	16.92 – 31.1	22.38 ± 3.21
Significance p	> 0.05, NS		> 0.05, NS		> 0.05, NS	

All results are expressed as Mean ± standard deviation, p< 0.05 is significant

In this study, there were a larger number of males than females (66% vs 34%). There were no significant differences in anthropometric parameters between the diabetic and control groups.

Table-3: Comparison of cardiovascular parameters among the study population

	Diabetes	Controls	Significance P
Resting heart rate	77.85± 4.8	74.55± 8.52	<0.05, S
Systolic blood pressure	105 ± 11.87	114.08 ± 9.56	<0.001, HS
Diastolic blood pressure	64.52 ± 6.90	67.60 ± 4.66	<0.001, HS
Mean blood pressure	78.01 ± 7.86	83.09 ± 5.48	<0.001, HS
Pulse pressure	40.48 ± 8.74	46.48 ± 8.19	<0.001, HS

All results are expressed as Mean ± standard deviation, p< 0.05 is significant

The results obtained during the study of the autonomic cardiovascular activity showed that in the resting supine position, diabetic patients had significantly higher HR values (77.85± 4.8 bpm vs 74.55± 8.52 bpm for the control group, P<0.05) also, the systolic and diastolic blood pressure were significantly more in diabetic group compared to non diabetic control subjects, (p<0.001 and p<0.001). We attributed this increase in heart rate and increase blood pressure to the parasympathetic dysfunction in diabetic patients.

Autonomic changes

To test the autonomic changes cold pressor test and standing test (30:15 RR ratio) were chosen as the testing tools.

Table- 4: Comparison of Standing test 30:15 RR ratio between the groups

Groups	N	RR 30:15 ratio
Diabetics	50	0.98±0.04
Controls	50	1.36±0.25
Significance	**p**	<0.001, HS

All results are expressed as Mean ± standard deviation, p< 0.05 is significant

In our study on performing the standing test i.e. immediate heart rate response to standing calculated by shortest R-R interval at or around the 15th beat, and the longest RR interval at or around the 30th beat after starting to stand, characteristic heart rate response which was expressed by 30: 15 ratio, it was observed that highly significant difference existed between the diabetes and control groups (Table 6) showing that parasympathetic dysfunction occurs in diabetics.

Table-5: Comparison of mean blood pressure during various steps of the cold pressor test among the study population

	Mean SBP		Significance	Mean DBP		Significance
	Diabetes	**Control**	**p**	**Diabetes**	**Control**	**P**
Baseline	105 ± 11.87	114.08 ± 9.56	<0.001, HS	64.52 ± 6.90	67.60 ± 4.66	<0.001, HS
Ice Immersion						
30 sec	106.24±11.76	119±16	<0.001, HS	65.96±6.48	74.40±6.61	<0.001, HS
90 sec	107.48±11.05	119.44±9.07	<0.001, HS	66.64±6.74	74.76±6.52	<0.001, HS
2 min	108.68±10.12	122.92±9.04	<0.001, HS	67.64±6.78	77.96±6.60	<0.001, HS
Post immersion						
1min	103.36±13.09	112.92±9.43	<0.001, HS	64.20±6.18	68.48±6.21	<0.05,S
2min	104.44±11.09	113.72±8.60	<0.001, HS	64.04±6.27	68.32±4.90	<0.001, HS
5min	104.20±10.37	113.60±9.07	<0.001, HS	64.44±6.97	67.80±4.54	<0.05,S

All results are expressed as Mean ± standard deviation, p< 0.05 is significant

The changes in systolic as well as diastolic blood pressure during the cold pressor test were significantly less in the diabetes group compared to the control group.

Immersion of hand in cold water produced a marked increase in HR, SBP and DBP. These changes can be explained on the basis of increased sympathetic activity with release of nor epinephrine and epinephrine.[11] In the diabetes group increase in these parameters was blunted.

Table-6: Changes from baseline blood pressure during various steps of the cold pressor test among the study population

	Diff Mean SBP		Significance	Diff Mean DBP		Significance
	Diabetes	**Control**	**p**	**Diabetes**	**Control**	**P**
Ice Immersion						
30 sec	1.24±1.71	5.08±4.22	<0.001, HS	1.44±1.62	6.80±5.27	<0.001, HS
90 sec	2.48±3.37	5.36±4.09	<0.001, HS	2.12±1.53	7.16±5.08	<0.001, HS
2 min	3.68±3.39	8.84±4.43	<0.001, HS	3.12±1.62	10.36±5.67	<0.001, HS
Post immersion						
1min	-1.64±4.88	-1.16±4.12	>0.05,NS	-0.32±1.63	0.88±4.63	>0.05,NS
2min	-0.56±1.07	0.36±3.76	>0.05,NS	-0.48±1.79	0.72±3.02	<0.05,S
5min	-0.80±2.74	-0.48±1.37	>0.05,NS	-0.08±0.39	0.20±1.52	>0.05,NS

All results are expressed as Mean ± standard deviation, $p< 0.05$ is significant

The variation of blood pressure (both systolic and diastolic) i.e. changes in the blood pressure after exposure to the ice cold water compared to the baseline blood pressure (readings taken before immersion) shows significance in diabetes group when compared to controls. The maximum variation in the SBP was seen at 2 min after immersion with changes reaching a mean value of 3.68 mmHg in the diabetes group and 8.84 mmHg in the control group. The diastolic blood pressure change in diabetics at 2 min after immersion shows significance compared to the control group. It also shows a significant change in difference from the baseline of the systolic and diastolic blood pressure throughout the ice immersion phase of cold pressor test.

DISCUSSION

Immersion of the contralateral hand in cold (ice) water typically results in a 50–60% reduction in peripheral skin blood flow at the contralateral pulp index surface. There is a predominantely peripheral component, but pain generates a centrally mediated response. Smooth muscle microvasculature in the periphery reacts sympathetically by increasing heart rate, blood pressure and cardiac output to stressor tasks like cold pressor test and this is blunted in case of diabetes mellitus patients due to sympathetic dysfunction.[88] This can help detect major adverse cardiac events.

The results of this study on native Sullian population illustrate the findings that cardiac autonomic dysfunction is present even in diabetic patients who are asymptomatic the findings being similar to other studies.

SUMMARY & CONCLUSION

The following points have been inferred from the study group patients:

Evaluation of cardiovascular reflexes in type 2 DM subjects with paucity of related symptoms constitutes an important feasible and reproducible bedside clinical technique.

It should be included as a routine in the work-up of patients of type-2 diabetes as it often uncovers autonomic neuropathy even in the asymptomatic state. It is of crucial importance to pinpoint some high-risk cases with probability of sudden cardiac death.

It is also a pointer to embark upon a search for other complications of diabetes often associated with it.

Ethical Clearance- Taken

Source of Funding- Self

Conflict of Interest - Nil

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To Compare the Cardiac Output Response and Severity in COPD Patients when Subjected to a Submaximal Upper Limb Exercise

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ABSTRACT

Introduction: Patients with Chronic obstructive pulmonary disease (COPD) are exposed to expiratory loads and dynamic hyperinflation as a consequence of expiratory flow limitation. So the alterations in lung mechanics might affect cardiac function. This altered haemodynamic response in COPD patients are more pronounced during physical activity than at the resting state. This is one of the main cause of exercise intolerance. This study tries to correlate the severity of COPD with exercise induced cardiac output response.

Materials and Method: This study was carried out in two groups with 30 in each group, Group A as controls and Group B with established COPD patients. Group B were again subdivided into Mild subgroup, Moderate subgroup and Severe subgroup depending on their FEV1 % which is commonly used to assess the severity of COPD. Pulmonary function tests parameters (mainly FEV1%, FEV1/FVC%,) were assessed by Spirometer. The cardiac output and stroke volume were measured by the Cardiac Output Monitor using bio-impedance method initially in the resting subject**.** Then the subject was asked to perform handgrip at fifty percent of the maximum strength for thirty seconds and peak cardiac output and stroke volume was measured again without altering the posture of the volunteer. **Conclusion:** As the Severity of COPD increases , Basal cardiac output was at a higher level compared to controls and raise in cardiac output during exercise was less when compared to controls. We conclude that the cardiac parameters limit the exercise endurance in the moderate and severe COPD patients.

Keywords: *COPD, Cardiac output, Bio-impedance method*

INTRODUCTION

Patients with obstructive lung disease are exposed to expiratory loads and dynamic hyperinflation as a consequence of expiratory flow limitation. So the alterations in lung mechanics might affect cardiac function[(1)]. This altered haemodynamic response in COPD patients are more pronounced during physical activity than at the resting state[(2)]. So this aberrant haemodynamic response may contribute to the decreased exercise tolerance in COPD patients. Normally any type of exercise will increase the cardiac output, called as physical activity induced cardiac output response. In COPD patients the physical activity induced cardiac output response is altered [(2)]. This Blunted cardiac output response is very important determinant in impaired physical activity of COPD patients.

Normally Cardiac out put is measured using the dye dilution, thermo dilution, or the oxygen consumption estimation methods. These are invasive methods. However Cardiac output can be done noninvasively by means of Thoracic Electrical Bioimpedance method. This technique equates changes in thoracic impedance to changes in thoracic blood volume. When a small current is applied across the thorax, various biologic phenomena impede its passage. Pulsatile flow of blood down the aorta

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during the course of the cardiac cycle induces rhythmic changes in impedance to the electric current – impedance decreases slightly during systole and increases during diastole. Applying suitable electrical filters permit isolation of the impedance changes induced by the pulsatile aortic flow of blood. Mathematical modeling permits estimation of the stroke volume from a trace of the sequential changes in thoracic impedance over time. The first such mathematical modeling was proposed by Kubicek [3].Several variants have been proposed to the Kubicek equation for stroke volume estimation; in an attempt to further refine the process. Stroke volume thus estimated is used in conjunction with heart rate and blood pressure, to compute cardiac output and systemic vascular resistance.

The validity of SV measurements by means of Bio-impedance method has been extensively shown in healthy subjects and cardiac patients [4,5]. Comparisons have been made with a wide range of invasive techniques e.g. the direct Fick method [6,7], dye – dilution [8] and with the technique of CO2 rebreathing[9,10] Correlation coefficients between SV measurement using Bio-impedance method and the reference method ranged 0.87 – 0.94. During strenuous exercise, however, motion and respiratory artifacts can become a large technological impediment.

MATERIALS AND METHOD

This study was conducted in the Institute of physiology and experimental medicine in collaboration with department of thoracic medicine, madras medical college, Chennai. This study is a cross sectional study and was carried out among 60 subjects in two groups with 30 in each group, Group A as controls and Group B with COPD patients. Group B was divided into Mild, Moderate and severe depending on FEV1 % [11] .Normal healthy volunteers were recruited from Master Health check up scheme. Inclusion criteria for group A (controls) were Males of 40-60 years of age, Weight 50-70Kgs, Height 150-170cm, non-smokers and FEV1 84-120 % 0f predictive value. Exclusion criteria for Group A were Females, Smokers, any form steroid usage, any known diseases like Cardiac diseases, renal diseases, liver diseases, Joint dysfunctions, Endocrine disorders and Upper limb dysfunction. Inclusion criteria for group B were Males of 40-60 years of age, Weight 50-70Kgs, Height 150-170cm, chronic,FEV1 18- 76% of predictive value and not reversible. Exclusion criteria for group B were same as per group A. Written consent was obtained from both groups. The Ethical committee of Madras medical college had approved the proposal. The individuals in both the groups were subjected to the pulmonary function test using spirometry. Pulmonary function tests parameters were assessed by spirometry using (Super Spiro, U.K) real time flow loop spirometry machine before and after salbutamol inhalation.

The cardiac output and stroke volume were measured by the Cardiac Output Monitor (NICOMAN, L&T, INDIA) otherwise called Thoracic Electrical Bio impedance (TEB) machine using bio-impedance method initially in the resting subject. Then the subject was asked to perform handgrip (Using handgrip Dynamometer) in the dominant hand at fifty percent of the maximum strength for thirty seconds and peak cardiac output and stroke volume was measured again without altering the posture of the volunteer. The procedure was repeated in COPD subjects and the values were compared. Heart rate was assessed by the same monitor by calculating the R-R interval. Thoracic Electrical Bioimpedance (TEB), with a symbol Z [W], is an electrical resistance of the thorax to a high-frequency, very-low magnitude TEB measurement current. TEB utilizes the patient's thorax as an impedance transducer. The patient is connected to NICOMAN TM (L&T, INDIA) via a patient cable attached to eight solid-gel, disposable electrodes.

Stroke volume (SV) is calculated according to the formula of Kubicek[3]

$$SV = r \times (L/Z_0)2 \times dZ/dtmax \times LVET$$

Where r = resistivity of blood (calculated as 0.022 x haemotocrit)[12]

Z_0= baseline thoracic impedance

dZ/ dtmax = the maximum change in impedance during systole.

LVET- left ventricular ejection time.

Measurements are made continuously and processed by a computer. SV is calculated with a computer derived averaged signal of 20 consecutive heart beats. Cardiac output (CO) is calculated as SV x cardiac frequency (fc). Nevertheless, as the validations of Bio-impedance method in COPD have not been done, our analyses in this study were based on changes in SV and CO (difference between resting and peak during exercise) rather than on absolute values.

RESULTS

Table 1- Comparison of different variables between groups using One way ANOVA

Variable	Group A Normal People n= 30 Mean ± SD	Group B- COPD Patients n = 30			F value	p value
		Mild n = 15 Mean ± SD	Moderate n = 6 Mean ± SD	Severe n = 9 Mean ± SD		
Age (Yrs)	49.77 ± 6.13	50.4 ± 5.32	52.67 ± 6.83	50.78 ± 7.2	0.38	0.76*
Height (cm)	160.37 ± 5.79	160.53 ± 6.58	159.5 ± 6.28	164.44± 4.12	1.32	0.28*
Weight (Kg)	61.03 ± 4.85	61.47 ± 4.86	58.83 ± 6.24	58.33 ± 4.09	1.13	0.34*
Mean FEV1%	93.7	61.4	42.17	29.67	-	-

(* Not Significant; SD- Standard Deviation)

Table 2 - Comparison of Resting Cardiac output between controls and patients

Groups	n	Mean	Std .deviation	One –Way ANOVA F-Test
Control	30	4.8063	0.39032	F= 32.8 p = 0.001 Highly significant
Mild	15	5.2740	0.39275	
Moderate	6	5.9267	0.25288	
Severe	9	6.0333	0.37513	

Table 3: Comparison of change in Cardiac output for per Kg increase in handgrip between controls and patient subgroups (Multiple Comparisons)

Group	Group	Mean Difference	p Value
Control	Mild	0.0526	< 0.001 (H.S)
	Moderate	0.0523	< 0.001 (H.S)
	Severe	0.0762	< 0.001 (H.S)
Mild	Control	- 0.0526	< 0.001 (H.S)
	Moderate	-0.0003	1.000 (N.S)
	Severe	0.0236	0.061 (N.S)
Moderate	Control	- 0.0523	< 0.001 (H.S)
	Mild	0.0003	1.000 (N.S)
	Severe	0.0236	0.210 (N.S)

H.S- Highly significant, N.S – Not significant

Table - 4: Comparison of change in Stroke volume per Kg increase in handgrip between controls and patients' subgroups (Multiple Comparisons)

Group	Group	Mean Difference	p Value
Control	Mild	1.1481	< 0.001 (H.S)
	Moderate	1.8875	< 0.001 (H.S)
	Severe	2.1897	< 0.001 (H.S)
Mild	Control	- 1.148	< 0.001 (H.S)
	Moderate	0.7393	0.003 (H.S)
	Severe	1.0416	< 0.001 (H.S)
Moderate	Control	- 1.887	< 0.001 (H.S)
	Mild	- 0.7393	0.003 (H.S)
	Severe	0.3022	1.000 (N.S)

H.S- Highly significant, N.S – Not significant.

Table - 5 : Comparison of change in Heart rate for per Kg increase in handgrip between controls and patients

Group	Mean (ml)	Std .deviation	One –Way ANOVA F-Test
Control	0.4793	0.11214	F=44.8 p = 0.001 Highly significant
Mild	1.1153	0.80060	
Moderate	2.1967	0.27053	
Severe	2.7056	0.98288	

DISCUSSION

In the present study it has been found that the resting cardiac output was increased significantly in COPD patients compared to controls (p = 0.001).With increasing severity of COPD, the resting cardiac out put also progressively increased to statistically significant level. (p = 0.001, highly significant).It shows that, with increasing severity of COPD, the heart has to do more work to compensate the respiratory impairment even at rest. The control and the COPD patients in our study have been subjected to only 50% of their maximum level, for calculation of the changes in Cardiac output. They are therefore still in the ascending limb of the stroke volume curve during their exercise. One should therefore expect an increase in stroke volume and not a decrease. We found that with increasing severity of COPD, stroke volume was actually decreased than the resting value during exercise. It might be due to decrease in the cardiac muscle contractility in COPD patients during their disease progression. Also, it has been found that the increase in heart rate during the handgrip maneuver was significantly higher in COPD patients compared

to controls (p =0.001, highly significant) and with increase in the severity of COPD, the corresponding increase in heart rate during the handgrip maneuver was significantly correlated. Though the heart rate change between moderate and severe subgroups were not statistically significant, it has been found that the severe COPD patients had more increase in heart rate during exercise compared to moderate COPD patients.

It gives the conclusion that, with increasing severity of COPD, heart rate was actually very much increased than the resting value during submaximal exercise compared to controls. So far from the changes of cardiac output, stroke volume & the heart rate during exercise and resting cardiac output in COPD patients shows,

As the Severity increases

1. Basal cardiac output was at a higher level compared to controls.

2. The increase in cardiac output during exercise was less when compared to controls.

3. This small increase in cardiac output during exercise was contributed more by the increase in the heart rate than the stroke volume.

4. The stroke volume decreases than the resting value during exercise.

5. The cardiac reserve has been decreased to a considerable level.

Inadequate increase in Cardiac output during exercise in COPD patients compared to controls. This aberrant response is related to disease severity and may limit exercise performance in severe airflow obstruction. We conclude that the cardiac parameters limit the exercise endurance in the moderate and severe COPD patients.

Nevertheless, as the validation of Bio-impedance method in COPD is limited, our analyses in this study were based on changes in SV and CO (difference between resting and peak during exercise) rather than on absolute values. Although current study did not take any absolute value in Bio impendence method for assessing the cardiac output, the resting cardiac output shows significant difference between controls and COPD patients.

CONCLUSION

From the above points present study came to the conclusion that clear difference was found in the haemodynamic response to exercise between patients and controls. The increase in cardiac output in COPD during exercise was diminished, which was insufficiently compensated for by an augmentation in heart rate rather than by stroke volume.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Obtained

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Relationship between Student's Family Socio-economic Status, Gap Year/years after Schooling and Self-concept: A Cross-Sectional Study among Medical Students

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ABSTRACT

Introduction: Over the past few decades, self-concept has been extensively studied in relation to academic achievement. However, there are numerous other factors that affect self-concept. The aim of the present study was to investigate the influence of family's socio-economic status and gap year/years after schooling on the self-concept of students.

Material and Method: The study was carried out on 100 first year M.B.B.S. students of Employees State Insurance Corporation Medical College, Faridabad. Self-concept was assessed using Self Description Questionnaire III (SDQ III). Information on socio-economic status (SES) and gap year/years after schooling was obtained using a separate questionnaire. SES was measured by using modified version of Kuppuswamy's SES scale.

Findings: The authors found statistically significant lower self-concept scores in students belonging to lower middle class families as compared to those from upper and upper middle class. Similarly the self-concept scores of students with >1 gap year were significantly lower on some scales as compared to those without gap year.

Conclusion: SES of the student's family and gap year/years after schooling both adversely influence the self-concept. These findings imply that more attention should be paid to students from low SES families and to students who take gap year for the preparation of competitive exams in terms of funds, policies and motivation.

Keywords: *Self-concept, Socio-economic status, Gap year.*

INTRODUCTION

Family is generally considered as the smallest social unit in society. It is the family that provides for the basic needs of an individual up to a certain age. Therefore family's Socio-ecoomic status (SES) may have an impact on individual's self-concept. There are several definitions of self-concept but the most unanimously accepted is the one given by Shavelson et al. They have defined self-concept as the perception that each one has about oneself, formed from experiences and relationships with the environment, where significant people play an important role[1]. There is growing evidence that self-concept is associated with school achievement, job success, interpersonal compatibility and general happiness. A positive self-concept increases the ability of the individual to cope with challenging circumstances. Studies based predominantly on Western research have shown that self-concept is a multi-dimensional construct which is affected by a large number of physical, socio-economic and academic variables[2,3,4].

Gap year in Western countries is mostly a year when student learns to be independent, takes time to mature and often to pursue a passion. The concept of gap year is gaining popularity in India. However, it is utilized for preparing for various competitive examinations. A

gap year in context to present study is a year spent for more focused preparation of the Pre Medical Entrance Examination. It is taken by those students who fail to get through the Medical Entrance Examination in their first attempt after class 12th.

Socio-economic disparities and gap years after schooling may have far reaching influence on self-concept. Thus, the importance of self-concept in young adults cannot be ignored. To the best of researcher's knowledge, there is a dearth of research in this field in India.

OBJECTIVES

The authors have approached this research keeping two objectives in mind

1 To determine whether self-concept is significantly different between students of different socioeconomic status.

2 To determine whether gap year/years after schooling has any significant influence on self-concept.

METHODOLOGY

The study adopted an Ex-Post-Facto design[5]. It means a study in which the phenomenon has already taken place and cannot be manipulated. It establishes relationships and not causation and effect. This design is considered suitable because student's SES and gap years if any have already taken place and are not manipuliable

The study sample consisted of 100 First Year MBBS students, of both sexes who joined ESIC Medical College, Faridabad in October 2015.

The researchers used Self Description Questionnaire III (SDQ III) which is a self explanatory questionnaire, intended for use by late adolescents and young adults in the age range of 16-25 yrs[6]. No special training is needed to administer the SDQ III. The 136-item SDQ III assesses 4 areas of academic self-concept, 8 areas of non academic self-concept and a single general esteem. On the SDQ III, each item is a simple declarative statement with 8 possible responses, varying from definitely false scoring 1 to definitely true scoring 8. Each of the 13 SDQ III scales is inferred on the basis of responses to 10 or 12 items, half of which are negatively worded. The scoring for the negatively worded items is reversed. For each scale the lowest possible score is 10 or 12 and highest possible score is 80 or 96. The research instrument was piloted and used by the authors in a previous research on different set of medical students[7].

In addition to SDQ III another questionnaire was used to collect information about the student's SES and whether they joined the Medical College in the same year as the year of passing class 12th or they have taken gap years to prepare for Pre Medical Test. The SES of the students was measured by using modified version of Kuppuswamy's socio-economic status scale for the year 2007[8]. The scale includes the education, occupation of the head of family and income per month from all sources. Accordingly students were classified into upper, upper middle, lower middle, upper lower and lower class.

Informed consent was obtained and both the questionnaires were administered to all the students on a single occasion. No discussion was allowed during the administration of questionnaires. Confidentiality of student's information and data were maintained.

Statistical Analysis: Descriptive statistics were used to calculate the means and standard deviations of SES and the 13 scales of SDQ III. One way ANOVA was employed to examine the differences in the self-concept between students of different socio-economic groups and between students with and without gap years. p value <0.05 was considered significant. The Cronbach's α coefficients for this sample were found to be adequate for all 13 scales.

RESULTS

The frequency analysis of the study group with respect to SES and gap year/years after schooling and gender are summarized in Table I. The scores on all 13 scales of self-concept between the three socio-economic groups are presented in Table II. No differences were found between the Upper and Upper middle socio-economic groups. However, significant differences were found between the scores of Upper and Lower middle and Upper middle and Lower middle groups. Table III presents the scores of students with >1 gap year, one gap year and no gap year. Significant differences have been observed on some scales between students with >1gap year and no gap year.

Table I: Frequency analysis of the study group

Socio-economic status	**No. of students**
Upper	30
Upper middle	44
Lower middle	26
Gap year/ years after schooling	
>1	27
1	43
0	30
Gender	
Male	50
Female	50

Table II: Comparison of SDQ III scores between students of different socioeconomic states

Scale	**Upper (U) N=30**	**Upper middle (UM) N=44**	**Lower middle (LM) N=26**	**p value U Vs UM**	**p value U Vs LM**	**p value UM Vs LM**
Maths	59.43±13.02	59.48±13.00	51.46±13.29	.989	.025*	.015*
Verbal	61.17±7.21	57.77±9.90	46.96±11.60	.142	.000*	.000*
Academic	59.70±8.85	55.89±11.22	45.38±8.67	.108	.000*	.000*
Problem solving	59.20±8.92	57.48±9.00	51.65±8.50	.413	.002*	.009*
physical ability	51.23±12.52	56.18±14.00	47.96±13.32	.122	.364	.015*
physical appearance	54.83±9.69	55.77±10.28	43.04±8.33	.681	.000*	.000*
same sex peer relation	60.23±8.88	58.86±10.08	51.48±11.33	.567	.002*	.004*
opposite sex peer relation	52.47±14.01	52.25±10.33	42.31±14.90	.943	.004*	.002*
parent relation	68.53±7.78	64.77±11.56	59.15±10.91	.130	.001*	.031
spiritual values/religion	60.37±16.60	62.70±14.29	59.31±9.38	.482	.778	.329
honesty/trust worthiness	72.60±6.84	70.02±10.36	64.62±8.74	.230	.001*	.017*
emotional stability	52.03±11.66	51.64±12.46	43.77±9.59	.885	.009*	.007*
general esteem	78.37±10.25	76.32±10.82	60.88±13.96	.456	.000*	.000*
Total score	790.17±61.21	779.14±62.27	666.00±48.34	.425	.000*	.000*

*P <0.05 Significant

Table III: Comparison of SDQ III scores between students with and without gap years

Scale	Gap >1yr N=27	Gap = 1yr N=43	0 Gap yr N=30	p value Gap>1yr Vs Gap=1yr	p value Gap>1yr Vs 0 Gap yr	p value Gap=1yr Vs 0 gap yr
Maths	52.22±15.86	59.70±12.73	58.70±10.96	.023*	.067	.751
Verbal	52.11±10.93	56.49±10.63	58.73±11.23	.105	.024*	.388
Academic	50.19±11.87	54.77±11.28	57.33±9.95	.095	.017*	.322
Problem solving	53.44±9.04	57.05±8.76	58.40±9.73	.112	.044*	.535
physical ability	54.63±13.89	48.26±13.81	56.87±11.89	.054	.527	.008*
physical appearance	50.44±12.05	52.44±10.70	53.37±10.58	.463	.321	.726
same sex peer relation	56.07±12.28	58.81±9.17	56.67±10.87	.298	.834	.400
opposite sex peer relation	47.56±13.14	50.40±12.46	50.73±15.08	.393	.376	.916
parent relation	59.74±10.13	66.07±9.46	66.33±12.42	.017*	.021*	.917
spiritual values/religion	60.67±12.09	63.28±13.79	58.43±13.51	.446	.546	.146
honesty/trust worthiness	66.00±8.10	70.19±8.91	71.30±10.69	.069	.034*	.615
emotional stability	46.59±12.09	50.12±11.37	51.93±12.48	.231	.094	.523
general esteem	67.70±14.68	73.88±12.45	76.23±13.00	.060	.017*	.458
Total score	717.37±77.91	760.07±70.94	775.03±79.21	.023*	.005*	.406

*P<0.05 Significant

DISCUSSION

The study was designed to examine the relationship between student's family SES, gap year/years after schooling and self-concept. Presently, no literature is available to the researchers on the influence of gap year/ years after schooling on self-concept and the literature available on the influence of SES on self-concept seem to be inconsistent.

The findings of the present study indicate statistically significant lower self-concept scores on all scales except spiritual values and physical ability in students belonging to lower middle class family as compared to those of upper and upper middle class. These results demonstrate that parent's education, occupation and income influences their beliefs, behavior and expectations, this leads to providing better financial, social and educational support. Families with low SES are more concerned with providing basic needs only to their children .Since self-concept is a multi-dimensional construct which fluctuates with home environment, social norms, emotional experiences and many other factors, parent's SES play a crucial role in shaping a child's self-concept. The constant stressors that accompany poverty, reduced parental involvement and hostile living environments profoundly affect an individual's self-concept[9]. Similar results have been reported earlier in separate studies by Santrock[10], Eamon[11] and Hochild[12]. However, the results are not consistent with the findings of Cecelia[13] and Gupta and Wogu[14] who found no statistically significant relationship between student's family SES with respect to self-concept.

In the present study significant differences have been observed between the scores of verbal, academic, problem solving, parent relation, honesty and emotional stability scales of self-concept in students with more than one gap year and without gap year after schooling. Gap year is the time when a student goes through emotions of hopes, fears, goals and threats. The syllabus is extensive and there is pressure from all quarters to clear the exam. The anxiety of wasting a year in case of failure creates frustration and sense of helplessness which in turn adversely impacts the self-concept .Parents must realize that they have to provide for not only the most compelling physiological needs like food, water and warmth but they must also provide love, respect and acceptance whatever be the result. Out of this love, respect and acceptance grows a feeling of esteem and

attainment of a positive self-concept.

CONCLUSIONS

The study examined the influence of SES and gap year/years after schooling as correlate of self-concept. The findings indicate that lower SES of the family and gap year/ years after schooling adversely influence the self-concept of students. Given that most determinants of self-concept are amenable to intervention, an examination of the nature of relationship between self-concept, SES and gap year/years after schooling has important implications on psychosocial health and well being and ability to care for the self. The result of the study is significant in that it will help

1 General public in understanding the need for parental education, income and occupation in the overall development of child.

2 Government to draft policies aiming at reduction in socio-economic differences and allocating more funds to support students from lower socio-economic status.

3 Parents to understand that there is lot of stress on the student during the gap year. Constant motivation and measures to alleviate anxiety are needed.

Conflict of Interest: None

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Ethical Clearance: Permission was taken from institutional research committee

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Role of Body Mass Index in Better Evaluation of Obesity

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ABSTRACT

The prevalence of severe obesity among children and young adults has increased over the past decade. The identification and monitoring of the amount of body fat have been receiving special attention in aspects related to health promotion, not just for its actions in the prevention and in the control of cardiovascular diseases but also for their induction and association with risk factors, especially in the plasmatic lipid levels and arterial pressure. The relationship between body mass index (BMI) with the blood pressure levels (systolic and diastolic) and serum lipids (TC, HDL-c, LDL-c, VLDL-c, TG) was investigated. In a group of sixty men (aged 18 to 26 years old), obesity was detected in 5 and 19 men by BMI (≥ 30 kg/m2). BMI was positively correlated with blood pressure (systolic and diastolic). Moreover, BMI was significantly correlated with all lipids and lipoprotein fractions VLDL-c and triglyceride. The associated use of BMI to better evaluate obesity may improve the study of blood pressure levels and serum lipid changes that are commonly associated with obesity.

Keywords: *Body mass index; Obesity; Blood pressure; Lipid.*

INTRODUCTION

The prevalence of severe obesity among children and young adults has increased in recent years[1] and has led to a heightened awareness and concern about the cardiovascular and metabolic health of persons in this age group. In 1999–2004, almost 4% of children and young adults in the United States 2 to 19 years of age were classified as having severe obesity[2] and as recently as 2011–2012, the prevalence of severe obesity increased to approximately 6% in this age group[1] ; however, the prevalence of cardiometabolic risk factors accompanying severe obesity in these children and young adults is unclear.

Obesity is considered to be a major risk factor for cardiovascular disorders according to the American Heart Association. In young subjects, the prevalence of obesity more than doubled over the past 15 years. Excessive adiposity in adolescents imposes an even larger risk for future development of cardiovascular diseases, relative to obesity developed in the adult Life.

Excessive adiposity may arise as a consequence of abnormality in the lipidic metabolism, being often associated with dyslipidemia and arterial hypertension[2].

Indeed, according to the National Institute of Health, obesity should be seen as a chronic degenerative disorder, since it increases the risks of early death even when it is minor.

Body composition has fundamental importance in the quality of life[4] and is a powerful predictor of mortality and morbidity in humans[5].

Variations in body fat content and regional fat distribution, whatever their origin is (genetic, acquired), seem to be potential candidates to explain, at least in part, the changes in cardiovascular risk profile.

The excess accumulation of body fat, in the central part of body and/or total body fat[8], is a sign of abnormal lipid metabolism and is frequently associated with dyslipidemia and arterial hypertension[6,9].

The most common estimate of body composition in populations has been the body mass index, which was actually developed as a measure ofweight /height^2 and not as an index of obesity[13].

Its importance is due to values around 30 kg/m^2 (obese subjects) to correlate with high incidence of diseases, mainly arterial hypertension, lipid disorders - high cholesterol, triglyceride and cardiovascular diseases[14].

In reason of the importance of recognizing subjects with high risk develop arterial hypertension and other metabolic disorders, and the operational simplicity of the anthropometric methods, the present work has an objective to correlate anthropometric index with the blood pressure and serum lipids.

MATERIALS AND METHOD

Sixty men, ranging in age from 18 to 25 years old were studied. The sample consisted of subjects without any medication, especially diet and known disease.

All participants signed an informed consent approved by the Ethics Committee.

Body mass index (BMI) was calculated as weight/ height^{2} [16].

Arterial blood pressure was measured with a mercury sphygmomanometer, using the disappearance of Korotkoff sounds (phase V) as a criteria for the determination of diastolic blood pressure. Arterial blood pressure was measured by a single observer in the right arm of seated participants. A rigorously standardized protocol was followed in which the participants were seated at least 10 minutes prior to the first measurement and at least 2 minutes elapsed between three repeat measurements. Cuff size was based on arm dimensions (cuff were long enough to completely encircle the arm and wide enough to cover two-thirds the length of the upper arm). The values used in the present analysis are the means of all measurements realized[16].

In all subjects 10 ml venous blood was collected at 8:00 to 9:00 a.m. after an overnight fast. After collection of serum by centrifugation, serum total cholesterol (TC), high density lipoprotein cholesterol(HDL-c), low density lipoprotein cholesterol (LDL-c), very low density lipoprotein cholesterol (VLDL-c) and triglyceride (TG) were analyzed.

The total cholesterol level was measured by CHOD-PAP method, LDL-c by polyvinyl sulfate. The HDL-c was separated with the phosphotungstic acid/ magnesium chloride method. Triglyceride, VLDL-c were measured by the enzymatic colorimetric test (GOP-PAP method)[17].

Statistical analysis

The statistical analysis was performed using software SAEG (System Analysis Statistical Genetic). The 0.05 alpha level was adopted as criteria for statistical significance. Descriptive statistics (means and standard deviations) were calculated for all variables. Pearson's correlation coefficients were used to show the relationship between variables.

RESULTS

The mean systolic (108 ± 9 mmHg) and diastolic (70 ± 7 mmHg) blood pressure were in normal limits for almost all subjects, and only 6 subjects had values in hypertensive level (above 140/90 mmHg in accordance with the classification of the Joint National Committee)[16]. The mean lipid profile was in normal level for almost all subjects.

The total cholesterol level ranged from 122 to 270 mg/dl, and a total of 19 women with levels ≥ 200mg/dl, considered high level in accordance to the classification of the National Cholesterol Education Program[18].

The mean value for BMI was considered normal 22± 4 kg/m2 with a range from 16.1 to 36 kg/m^{2}.The majority of subjects analyzed by BMI were nonobese with a frequency distribution demonstrating that 50 subject had values below 25 kg/m2 (normal), 4 subject had values between 25 to 29 kg/m2 (overweight) and 6 subject had values ≥ 30 kg/m2 (obese) in accordance to the classification of the Consensus Latin American of Obesity[19] (TABLE 2).

It is important to note that 50 subjects had values into normal limits (< 25 kg/m2) when analyzed by BMI. The Pearson's correlation between blood pressure and anthropometric measurements are given in TABLE 3. Clearly, the values of BMI of all subjects correlated with systolic and diastolic blood pressure. When subgroups of subjects with different levels of BMI were analyzed, it was demonstrated that there were no correlation between the BMI and blood pressure values in the normal subgroup (25 kg/m2), only in the overweight and obese group.

The correlation of BMI were significant with all lipids and lipoprotein fractions, Total Cholesterol, VLDL-c and Triglyceride.

TABLE 1 - Characteristics of subjects studied.

Variables	Men(n=60)
Age, years	20.6 ± 1.4
SBP, mmHg	108. ± 9.6
DBP, mmHg	70.5 ± 7.4
TC, mg/dl	181.8 ± 34.8
HDL-C, mg/dl	60.5 ± 12.4
LDL-c, mg/dl	102.9 ± 34.4
VLDL, mg/dl	18.0 ± 8.4
TG, mg/dl	92.6 ± 41.4
BMI, kg/m^2	22.2 ± 4.0

BMI = indicated body mass index;

SBP = systolic blood pressure;

DBP = diastolic blood pressure;

TC = total cholesterol;

HDL-c = high density lipoprotein cholesterol;

LDL-c = low density lipoprotein cholesterol;

VLDL-c = very low density lipoprotein cholesterol;

TG = triglyceride .

Values are represented as mean (SD).

TABLE 2 -Frequency distribution of BMI in accordance with the classification of the Consensus

Latin American of obesity .

BMI	Subjects
< 25 kg/m^2	50
25 - 29 kg/m^2	4
30 kg/m^2	6

TABLE 3 -Pearson's correlation coefficients between anthropometric measurement and blood pressure

Anthropometric measurements	SBP	DBP
BMI kg/m^2 (n = 60)	0.40***	0.30**
BMI < 25 kg/m^2 (n = 50)	0.17	0.14
BMI 25 a 29 kg/m^2 (n = 4)	0.31	0.96*
BMI ≥ 30 kg/m^2 (n = 6)	0.81*	0.17

*p < 0.05;

**p < 0.01;

***p < 0.001;

BMI = indicated body mass index;

SBP = systolic blood pressure;

DBP = diastolic blood pressure

TABLE 4 -Pearson's correlation coefficients between anthropometric measurements and serum lipids.

Anthropometric measurements	TC	LDL-C	HDL-C	VLDL-C	TG
BMI kg/m^2 (n = 60)	0.27*	0.30**	-0.35**	0.42***	0.43***
BMI < 25 kg/m^2 (n = 50)	0.10	0.18	-0.19	0.01	0.02
BMI 25 a 29 kg/m^2 (n = 4)	0.01	0.76	-0.47	0.95	0.95
BMI ≥ 30 kg/m^2 (n = 6)	0.76	0.76	-0.21	0.40	0.41

*p < 0.05;

**p < 0.01;

***p < 0.001;

BMI = indicated body mass index ;

TC = total cholesterol;

HDL-c = high density lipoprotein cholesterol;

LDL-c = low density lipoprotein cholesterol;

VLDL-c = very low density lipoprotein cholesterol and ;

TG = Triglyceride

DISCUSSION

Severe obesity in children and young adults is associated with a high prevalence of abnormal levels of cardiometabolic variables. A high prevalence of abnormal values for certain variables among children and young adults with class II or class III obesity may provide important information beyond that identified with the use of standard obesity classifications,

especially for boys and young men.

Determination of the severity of obesity can help identify children and young adults who are at the greatest risk for the negative health effects associated with obesity.

The importance of conducting studies in young subjects is demonstrated by the increasing prevalence of obesity in this population, and by the fact that minor excess fat developed at young ages imposes an even higher vascular risk than the onset of obesity in adulthood[22].

The main results of our study are the demonstration that there is a significant group of young men whose BMI is strongly correlated with blood pressure and serum lipid profile.

We found that a significant proportion of subjects in our study had elevated fat proportion, while been classified as normal weight by the BMI. Based on the important recognition that excessive adiposity is linked to cardiovascular and metabolic disorders, anthropometric methods are recommended because of their accuracy and simplicity.

Anthropometric methods are of utility in several domains including epidemiological vigilance, scientific investigation, individual and social health screenings, and should be particularly recommended for individuals that are not overweight or obese according to the BMI[8].

Obesity (≥ 30% BMI), excess accumulation of body fat, is a sign of abnormal lipid metabolism, and is an important predictor for hypertension, coronary heart disease, diabetes mellitus, hepato biliary disease[15] and frequently is associated with arterial hypertension and dyslipidaemia (high serum TG and low serum HDL-C rather than high serum TC and LDL-C)[8].

Obesity is not a homogeneous disorder. In a subgroup of obese individuals, the sympathetic tonus is increased to key organs, including the kidney, muscles and peripheral vessels.

Obese individuals are at increased risk of developing cardiac arrhythmia and sudden death when compared to normal weight individuals[23].

In healthy animals, obesity induced by excessive feeding is associated with sympathetic activation and hypertension. Sympathetic activation is precociously induced by overfeeding, and is reversed by weight loss. Modification in the sympathetic system induced by overfeeding seems to precede alterations in the renin-angiotensin system[20].

Subjects with lower levels of fat (overweight)show the same risks of heart disease, arterial hypertension and metabolic disorders when compare to that subjects with high and moderate percentage of fat body[3].

Our study and others studies as Fukui[25] and Nagaya[26] suggested the existence of a subgroup of subjects with "occult obesity" that are not aware for their lipid alterations and blood pressure.

It is important to consider anthropometric measurements beyond the BMI. While we know its advantages in population studies, it does not distinguish body composition, and may underestimate or overestimate the actual percentage of fat, keeping us from strongly correlate with blood pressure, serum lipids and cardiovascular risk. A more thorough evaluation and careful body composition is required for prevention and health promotion.

CONCLUSION

The increased body fat was positively related to disorders in lipid metabolism and blood pressure elevation. Severe obesity in children and young men is associated with a high prevalence of abnormal levels of cardiometabolic risk-factor variables. The prevalence of these abnormal values among children and young men appears to be dependent on both age and severity of obesity. The main results of our study are the demonstration that there is a significant group of young men whose BMI is strongly correlated with blood pressure and serum lipid profile.

So, increased BMI may be utilized for screening obese patient for risk of cardiovascular events and also for timely intervention with lipid lowering drugs.

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Comparison of Bleeding Time and Clotting Time in Healthy Young Volunteers with O and Non-O Blood Groups

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ABSTRACT

Bleeding time and clotting time are expected to be prolonged in O blood group compared with non O blood group as the level of von willebrand factor is high in non O blood group. There is limited studies available comparing the bleeding and clotting time in different blood groups.

Hence we planned to analyze the clotting time, bleeding time in healthy volunteers of O, A, B and AB blood groups. **Approach:** This cross sectional study was conducted in the department of Physiology in our institution. The available detail reports of 544 students passing through 1st year of MBBS over the years from 2012to2015 were analyzed with respect to age, sex, blood groups, bleeding time and clotting time. The blood grouping was done with the standard antiserum. Bleeding time and clotting time were estimated by Duke Method and capillary tube method respectively. Finally bleeding time and clotting time of different blood groups were compared and statistical analysis was done. **Results**: in this study clotting time was more in males compare to females. But there was no significant difference in bleeding time and clotting time among various blood groups.

Keywords: *Blood group, clotting time, bleeding time.*

INTRODUCTION

Plasma Von Willebrand factor is high in non O blood group[1]. While a deficiency of von willebrand factor is responsible for a hemorrhagic diathesis, elevated von willebrand factor level is reported as an important thrombotic risk factor [2, 3]. It is also reported that arterial occlusion, ischemic heart disease, atherosclerosis and deep vein thrombosis are more common in non O blood group [4-7].

Von willebrand factor is associated with platelet adhesion and aggregation which is an initiating factor in haemostasis after vascular injury[8]. Von willebrand factor is also the specific carrier of clotting factor VIII (Antihemophilic factor) in plasma and protects it from proteolysis degradation, prolonging its half-life in circulation and efficiently localizing it at the site of vascular injury[8]. Thus Von willebrand factor affects both bleeding time and clotting time[9]. Bleeding time and clotting time are expected to be prolonged in O blood group compared with non O blood group as the level of vWF is high in non O blood group[1]. Interestingly Mahapatra and Mishra (10) in their study have shown that bleeding time and clotting time are prolonged in non-O blood group in Indian population which is not supporting the observation made in the above mentioned study[1]. There are limited studies available comparing the bleeding and clotting time in different blood groups [10].

Hence we have planned to analyze the clotting time, bleeding time in healthy volunteers of O, A, B and AB blood groups.

Aims & Objectives

The present study aims

To assess the bleeding time and clotting time in A, B, AB and O blood group students.

To compare the bleeding time and clotting time

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between O- blood group and non-O blood group students.

MATERIALS AND METHOD

This cross sectional study was conducted in the department of physiology, Sree Mookambika institute of medical sciences. In our institution it is mandatory for all the medical students to do their blood grouping, bleeding time and clotting time during their 1st year study as a part of their practical skill. The available detailed reports of 544 young healthy volunteer students over the year from 2012-2015 were analyzed in respect of age, sex, blood group, bleeding time and clotting time. Finally bleeding time and clotting time of different blood groups were compared and statistical analysis was done. Blood group determination was done by mixing the sample of blood with antisera A and B and looking for clumping of RBCs under the microscope. Bleeding time was estimated by Duke Method and clotting time was estimated by capillary tube method[11].

RESULTS

Table 1: Comparison of clotting time and bleeding time among various blood groups

ABO	Clotting Time in minutes (mean±SD)	Bleeding Time In minutes (mean±SD)
A	3.34±0.81	2.41±0.65
B	3.30±0.75	2.38±0.58
AB	3.44±0.81	2.39±0.58
O	3.36±0.75	2.42±0.58
Anova Test	F value 0.380 P value 0.767	F value 0.176 P value 0.913
Inference	Not significant	Not significant

Table 2: Comparison of bleeding time and clotting time according to sex

	Male	Female	t value	P value	Inference
Bleeding time In minutes	2.37±0.59	2.42±0.59	1.165	0.281	Not significant
Clotting time In minutes	3.46±0.79	3.27±0.75	8.301	0.004	significant

Table 3: Comparison of bleeding time and clotting time according to Rh status

	Rh Positive	Rh negative	t value	P value	Inference
Bleeding time in minutes	2.40±0.59	2.47±0.61	1.568	0.211	Not significant
Clotting time in minutes	3.33±0.75	3.50±1.01	0.490	0.484	Not significant

RESULTS

There were 544 students selected for this study, among 544 students 206 male students (38%), 338female students (62%) were involved in this study. In this study 202 students (37%) were found as B blood group, 194 students (36%) were O blood group, 109 students (20%) were A blood group,39 students (7%)were AB blood group.94% students(510) were belong to Rh positive,6% students(34) were belong to Rh negative. In this study minimum bleeding time 1minute,maximum bleeding time 4.5 minutes, mean bleeding time 2.4±0.59.minimum clotting time 1.5 minutes, maximum clotting time 8 minutes, mean clotting time 3.3±0.76.

According to our study B blood group was predominant followed by O blood group (36%), A blood group (20%), and AB blood group(7%). clotting time was slightly more in AB group(3.44±0.81) and bleeding time was more in O blood group(2.42±0.58) when compared to other blood groups, but both were not statistically significant (Table1). We found higher bleeding time in females when compared to males, but were not statistically significant. The clotting time was more in males compared to females (Table2) it was statistically significant(p value-0.004).While analyzing the role of Rh status on clotting time and bleeding time, no significant difference was found (Table3).

DISCUSSION

Mahapatra et al showed prolonged clotting time in B group then O group. But in our Study there was no significant difference. Reddy et al found that in Caucasian patients with epistaxis 50.74% belonged blood group O compared with 45.10% of control group. A study by mahapatra et al showed no gender wise difference in bleeding time and clotting time. But our study showed higher clotting time in males. Roy et al found that females had higher bleeding time and clotting time compared to males. Studies by Roy et al, Mahapatra et al showed higher prevalence of O group 35.5% and 37.8% respectively. But in our study B blood group is more prevalent (37%) then O blood group (36%)

The outcome of this study may be helpful in identifying the state of coagulation cascade in different blood group people in our population and also provide more information in identifying the risk of thrombo-embolic events in ABO blood group individuals.

CONCLUSION

In the present study group, interestingly the clotting time was prolonged in males, which was statistically significant. But there was no significant difference in bleeding time and clotting time among various blood groups.

Ethical Clearance: Was taken from institute ethical committee.

Source of Funding- Self

Conflict of Interest - Nil

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A Comparative Study of Hematological Parameters in Normal and Hypertensive Individuals

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ABSTRACT

Hypertension isrecognised as a significant public health hazard. Most of the people with primary hypertension have a high systemic vascular resistance with relatively normal cardiac output. Hypertension is associated with risk of stroke, congestive heart failure and disease of small blood vessels with thickening and scarring and chronic renal disease.

The aim of the present study is to compare and analyse the relation between blood pressure and hematological parameters in hypertensives and normotensives in Kalaburagiso that it will be a useful predictor of cerebrovascular diseases and coronary artery disease through regular investigations. In the present study, the mean values of Hemoglobin, Erythrocyte count, Hematocrit, MCHC, WBC Count and Platelet count are found to be significantly higher and the mean values of MCV are significantly lower in hypertensives.

Keywords : *Hypertension, MI, Stroke.*

INTRODUCTION

Hypertension is found not only to increase the risk for mortality, but also for stroke, congestive cardiac failure and chronic kidney disease. Framingham study and other epidemiological investigations suggest that even mild high blood pressure could increase the risk for myocardial infarction, heart failure, stroke and chronic renal damage when hypertension was recognised as a significant public health hazard.[1]

A remarkable increase in hypertension has occurred with the prevalence between 30 and 40% of adults in the United States and most areas of the world and by 2025, there will be more than 1.5 billion people with hypertension, making it the most common noncommunicable disease [2].

AIMS AND OBJECTIVES

The aim of the present study is to compare and analyse the relation between blood pressure and hematological parameters in hypertensives and normotensives in Kalaburagi and the objective is, that it will be a useful predictor of cerebrovascular diseases and coronary artery disease through regular investigations. Identification of these high risk patients may allow an earlier introduction of antihypertensive treatment and correction of the risk factors to prevent the progression or to induce the regression of silent vascular damage before a clinical event develops by instructing change in the lifestyle or prescribing medications or both.

MATERIALS AND METHOD

The study is undertaken in 50 hypertensives taken as subjects and 50 normotensives taken as control during the academic year 2015-2016 KBNIMS, Kalaburagi with the age range being 40- 60 yrs. Ethical committee clearance was taken and consent obtained from all the study subjects. Blood pressure was recorded in the sitting posture in the right arm using mercury sphygmomanometer (Diamond deluxe BP apparatus, Pune, India) using both palpatory and auscultatory method. Three readings are taken and the average of the three recordings are obtained. Blood samples are collected after an overnight fasting from antecubital vein by making the subject to sit comfortably on a chair. About 3 ml of blood is collected in EDTA

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coated vaccutainers through disposable syringe under aseptic precautions. The sample is kept in automated 5 parts analyser(Sysmax company). The readings for Hemoglobin, RBC count, Hematocrit, WBC count and Platelet count are taken and noted. The RBC indices like MCV, MCH and MCHC are calculated from the known values of Hemoglobin, RBC count and Hematocrit.

RESULTS AND ANALYSIS

The data is analysed and all values are expressed as Mean ± standard deviation. Statistical significance of differences between control and study groups are evaluated by student ''t" test. A p-value of < 0.05 is considered to be statistically significant and p- value of< 0.01 is considered to be highly significant.

Table 1: The mean haematological values of normal and hypertensives

Parameter	Normotensive (MEAN ± SD)	Hypertensive (MEAN ± SD)	P value	Significance
Hemoglobin	10.90 ± 1.25	11.80 ± 1.68	< 0.01	HS
RBC count	3.88 ±0.36	4.14 ±0.54	< 0.01	HS
Hematocrit	31.44 ± 1.81	32.36 ± 3.21	< 0.05	S
WBC count	6628±1335	7704 ±1635	< 0.01	HS
Platelet count	2.83 ±0.80	3.47 ±0.89	< 0.01	HS
MCV	81.62 ±7.96	78.82 ± 8.32	< 0.05	S
MCH	28.15 ± 2.65	28.60 ± 3.12	> 0.05	NS
MCHC	34.65 ± 3.26	36.54 ± 4.27	< 0.01	HS

HS- Highly significant, S- Significant, NS- Not significant

The mean value of Hemoglobin in hypertensive group is found to be 11.80 g/dl (SD ± 1.68), while in normotensive controls it is found to be 10.90g/dl (SD ± 1.25).

The mean value of erythrocyte count in hypertensive group is found to be 4.41 millions/Cumm(SD ± 0.54), while in normotensive controls it is 3.88 millions/Cumm (SD ± 0.36).

The mean value of Hematocrit in hypertensive group is found to be 32.36% (SD ± 3.21), while in normotensive controls it is found to be 31.44 %(SD ± 1.81).

The mean value of Total leucocytecount in hypertensive group is found to be 7,704/cumm (SD ± 1635), while in normotensive controls it is found to be 6,628/Cumm (SD ± 1335).

The mean value of Platelet count in hypertensive group is found to be 3.47 lakhs/cumm (SD ± 0.89), while in normotensive controls it is found to be 2.83 Lakhs/Cumm (SD ± 0.80).

The mean values of MCV and MCH in hypertensive group are found to be 78.82fl (SD ± 8.32) and 28.60 pg (SD ± 3.12) respectivelyin hypertensives and 81.62 fl (SD ±7.96) and 28.15 pg (SD ± 2.65) respectively in normotensive controls .

The mean value of MCHC in hypertensive group is found to be 36.54g/dl (SD ± 4.27), while in normotensive controls it is found to be 34.65 g/dl (SD ± 3.26).

The mean values of Hemoglobin, Erythrocyte count, Leucocyte count and Platelet count are higher in hypertensive group with high significance. The mean value of Hematocrit is significantly higher in hypertensives when compared to normotensives. The mean value of MCV is significantly lesser in hypertensives. The mean value of MCH is higher in hypertensives with no significance.

The mean value of MCHC is significantly more in hypertensives.

DISCUSSION

In the present study, the mean values of Hemoglobin and Erythrocyte count are found to be significantly higher in the hypertensive group.

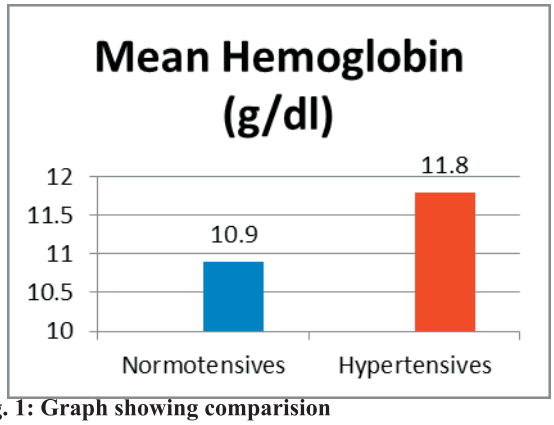

Fig. 1: Graph showing comparision

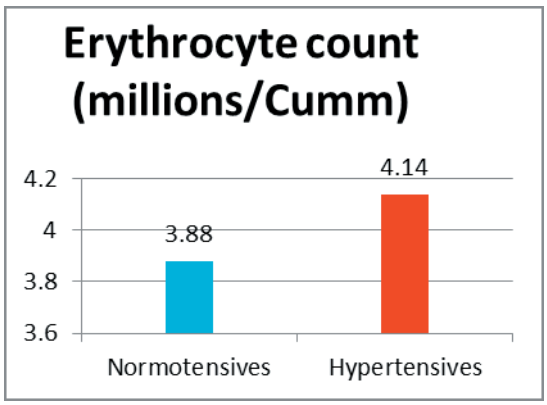

Fig. 2: Graph showing comparision of mean hemoglobin erythrocyte count

From these findings , it can be concluded that in primary hypertension, the Hemoglobin and Erythrocyte count are increased significantly.These findings are similar to the earlier findings by Giacomo B et al [3], Massimo Cirillo[4], Dan S. Sharp et al [5] and Al – Muhana et al [6].

Giacomo et al found that there is a decrease in MCV (by 2%) with increase in RBC count (by 7%) and platelet volume (3%). They stated that two ionic systems are involved in cell volume regulation, namely a loop diuretic – sensitive Na^+- K^+ symport and intracellular calcium, have also been reported to be altered in hypertension. Increasing intracellular calcium with ionophores makes red blood cells shrink their volume[3]. Al- Muhana et al determined complete blood count and other biochemical parameters in hypertensives and found Hemoglobin to be significantly higher in hypertensives [6].

Dan S Sharp et al studied the relation between MCV, RBC count, SBP and DBP. They found that MCV and RBC count are inversely correlated [5].The mean value of MCV is found to be significantly lower in hypertensive group. MCV appears to be inversely related to Systolic and Diastolic Blood pressures. The below findings suggest that there is decreased Mean corpuscular volume (MCV) in primary hypertensives. These results are consistent with the studies reported by Dan S. Sharp et al [5] Giacomo et al [3] and Al- Muhana et al [6]. Dan S. Sharp et al[5] studied the relation between blood viscosity and red cell measures in hypertensives , found hematocrit is a determinant of whole blood viscosity. Viscosity affects peripheral resistance to blood flow, and peripheral resistance affects DBP. At high RBC levels, MCV may be down regulated. This may lower whole blood viscosity and partially reduce DBP without compromising flow[5].

The mean values of Hematocrit are found to be significantly higher in the hypertensive group.

From the above findings it can be concluded that increased Hematocrit is seen in primary hypertensives.

This is similar to the findings of Giovanni de Simone[7], Massimo Cirillo et al[4] Dan S.Sharp et al[5] and Al- Muhana et al[6]. The mechanism underlying the association between hematocrit and blood pressure are the relations of hematocrit with whole blood viscosity ,of whole blood viscosity with peripheral resistance, and of peripheral resistance with blood pressure.It has been proposed that with treatment of anemia , cessation of vasodilation and increased blood viscosity , both resulting from the therapeutic increase in hematocrit, account for the increased peripheral resistance with rise of blood pressure observed. Therefore ,the greater blood viscosity caused by higher hematocrit and the consequent increased resistance to blood flow appear the most reasonable causes underlying the association between hematocrit and blood pressure in the present study.

High hematocrit in hypertension could reflect a true increase in red blood cell mass as well as hemoconcentration caused by a reduction in plasma volume. Data from the present report cannot rule out the possibility that high hematocrit is characteristic of hypertensive people with reduced plasma volume[4].

Leucocyte count :

In the present study the, the mean level of Total Leucocyte count is significantly higher in hypertensives.

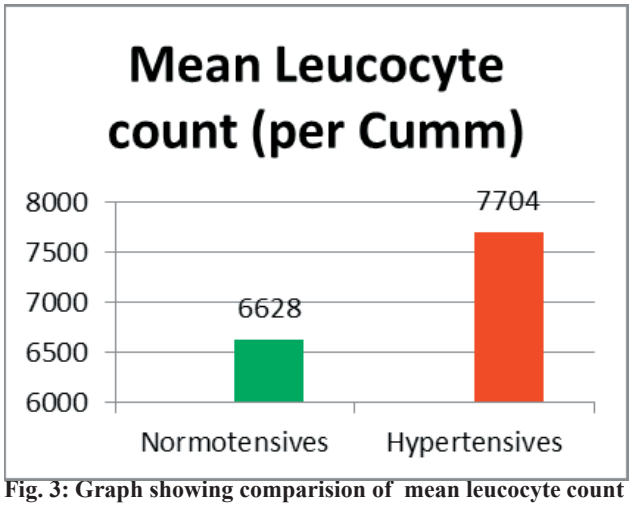

Fig. 3: Graph showing comparision of mean leucocyte count

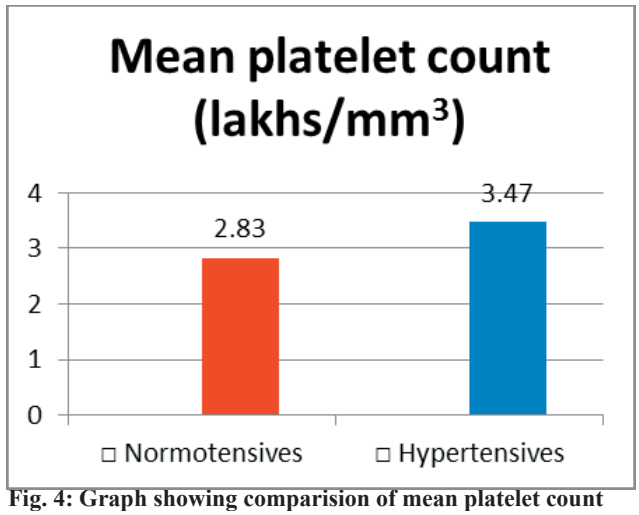

Fig. 4: Graph showing comparision of mean platelet count

The above findings show that there is increased WBC count in primary hypertensives. The result is similar to the findings reported by Chong Do Lee 8 , Jeremy G. Wheeler et al 9 , Benjamin D. Horne et al 10 Sun Ha Jee et al 11, Dong-Jun et al 12 and Al-Muhana et al 6. Chong Do Lee found that elevated WBC count is directly associated with hypertension and also with the risk of coronary artery disease and stroke incidence and mortality from cardiovascular disease. It is plausible that an elevated WBC count may enhance atherogenesis. Granulocytes and Monocytes are believed to be involved in the pathogenesis of atherosclerosis.

Monocyte –derived macrophages produce oxidants that can induce endothelial cell injury and subsequent thrombus formation. Activated WBCs also reflect the inflammatory activity of atherosclerosis that perpetuates vascular injury and tissue ischemia.

Sun Ha Jee et al conducted a 10- year prospective cohort study of mortality in relation to white blood cell counts. The study indicates that white blood cell count is an independent risk factor for all cause mortality and for atherosclerotic cardiovascular diseases mortality 11.

Platelet count

In the present study, the mean level of platelet count is significantly higher in the hypertensives.

The above findings show that there is increased platelet count in primary hypertensives. These results are significantly consistent with the studies reported by Giacomo B et al [3], MM Khandekar et al [13], Paul F Bray et al [14] and Al- Muhana et al [6].MM Khandekar et al studied platelet volume indices in the spectrum of ischemic heart diseases. The study reported that platelets have been implicated in the pathogenesis of cardiovascular disorders, including atherosclerosis and its complications. The increase in platelet consumption at the site of the coronary atherosclerotic plaque causes larger platelets to be released from the bone marrow. Because larger platelets are hemostatically more active, the presence of larger platelets is a probably a risk factor for developing coronary thrombosis and MI.

SUMMARY AND CONCLUSION

To summarise, in the present study, the variables found significant can be suggested as the predictors of hypertension. The results are consistent with others in that age and baseline systolic blood pressure are the strongest determinants of hypertension incidence.

In the present work, the parameters which are increased in primary hypertension are,Hemoglobin, Erythrocyte count, Hematocrit, MCH, MCHC, WBC count and platelet count while the mean values of MCV are lower.

The impact of an increase in relative red cell mass is to increase whole blood viscosity, primarily by increasing the number of particles per unit volume of blood (RBC), and thereby increase peripheral resistance to blood flow. To maintain blood flow,blood pressure increases. The deleterious consequence of increasing

pressure, presumably to maintain blood flow is partially compensated for by a concomitant decrease in redcell volume, thus attempting to counteract the viscous effects of a larger relative red cell mass with smaller cell size characteristics.

High blood pressure could theoretically cause high hematocrit by, for instance, inducing hemoconcentration through increased capillary filtration of plasma.

The present study reports an independent significant association between Hemoglobin, Hematocrit, RBC Count and prevalence of hypertension and a positive relation between Hemoglobin ,Hematocrit, RBC count and blood pressure.

As cytokines are potent inducers of leucocyte differentiation, it is speculated that an activated cytokine system might lead to elevated leucocyte count.

Larger platelets which are hemostatically more active is probable risk factor for developing coronary thrombosis and MI.

From the above study, it can beconcluded that in patients of primary hypertension, significant changes are seen in Hematocrit, Hemoglobin, RBC count, WBC count and Platelet count which can be used for early detection of hypertensive prone individuals.

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Conflict of Interest: The author declares no conflict of interest.

Source of Funding: Self-funded

Ethical Clearance: Approval of institutional ethical committee was taken to conduct the study.

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Study of Haemoglobin Values in Pulmonary Tuberculosis Patients at Different Stages of Chemotherapy

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ABSTRACT

Tuberculosis (TB) is an infectious disease caused by the bacterium Mycobacterium Tuberculosis (MTB). Tuberculosis generally affects the lungs, but can also affect other parts of the body. Tuberculosis is a potentially fatal contagious disease that can spread through the lymph nodes and blood stream to any organ in our body. Pulmonary tuberculosis occurs when M. Tuberculosis primarily attacks the lungs. The aim of present study was to establish the haemoglobin value as a guide to the progress, or improvements in the patients undergoing chemotherapy of pulmonary tuberculosis. So far, very few studies have been done on Hb value to observe the progress in tuberculosis patients. The present study was conducted on 100 individuals divided into two groups: Study group and Control group, between October 2013 to May 2014 in the department of Physiology, MIMS, Barabanki (UP). Study group comprised of 50 patients attending Outdoor of TB & Chest primarily presenting with complaints of cough and haemoptysis and also from various untreated sputum positive cases of pulmonary tuberculosis admitted in the ward of department of TB and Chest, MIMS. Control group comprised of 50 normal healthy MBBS students and employees of MIMS. The Mean Hb was highly significant (P<0.0001) at the time of admission and significant (P=0.0015) after 2 months of chemotherapy. It was not significant (P=0.15) after 6 months of therapy indicating that Hb values are reaching the range as in control group (Mean Hb after 6 months of therapy = 13.40 and Mean Hb in control = 13.07. this difference was statistically not significant). Improvement from anaemia was correlated with the treatment of infection.

Keywords: *Pulmonary Tuberculosis, Haemoglobin, Chemotherapy, Anaemia.*

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by the bacterium Mycobacterium tuberculosis (MTB). Tuberculosis generally affects the lungs, but can also effect other parts of the body. Tuberculosis is a potentially fatal contagious disease that can spread through the lymph nodes and blood stream to any organ in our body. Most people who are exposed to TB never develop symptoms because the bacteria can live in an inactive form in the body.

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Pulmonary tuberculosis occurs when M. tuberculosis primarily attacks the lungs. Muller[1] observed that patients with pulmonary tuberculosis do not usually manifest major blood changes. However it is a common observation that majority of them present with mild or moderate anaemia. The anaemia in tuberculosis mostly is normochromic normocytic, some present with normocytic hypochromic or microcytic hypochromic and rarely haemolytic anaemia was observed by various workers from time to time at different parts of the world. Tuberculosis continues to be India's biggest public health problem and responsible for nearly 500,000 death every year (Barua)[2]. The victim becomes cachexic and shows continuous downhill course as a result of ill health and associated malnutrition till death, unless the process is stopped by proper therapy. The high mortality and morbidity puts a great strain on country's economy and development. The annual incidence of bacteriologically confirmed new cases of tuberculosis is about 1.3 per

1000 of population, aged 10 and above in India (Survey of national tuberculosis Institute, Bengaluru1980). The clinical varieties of pulmonary tuberculosis observed are primary and post - primary tuberculosis. Primary tuberculosis is usually asymptomatic. In some cases a non – specific pneumonitis typically occurs in the lower or mid-lung zones. Hilar lymph nodes enlargement is usual. Post primary tuberculosis is the most common form of the disease in the adults, the patients usually presents with an infiltration with or without cavitation involving the posterior segment of the upper lobes. It is a common observation that majority of patients present with some degree of anaemia. But Rich[3] opined that anaemia is not a prominent features in the early stage except in disseminated tuberculosis. However it may be found in acute caseating tuberculosis. According to pinner[4], marked degree of anaemia indicates extra pulmonary spread or associated non – tubercular pathology.

MATERIALS AND METHOD

The present study was conducted on 100 individuals divided into two groups: Study group and Control group, between October 2013 to May 2014 in the department of physiology, MIMS, Barabanki (UP). Study group comprised of 50 patients attending Outdoor of TB & Chest, primarily presenting with complaints of cough and haemoptysis and also from various untreated sputum positive cases of pulmonary tuberculosis admitted in the ward of department of TB and Chest, MIMS. Control group comprised of 50 normal healthy MBBS students and employees of MIMS. The participants of this study were males and females of age group 17 – 70 years. Persons with bleeding disorder like – patients having hemorrhoids, malena, peptic ulcer disease, menorrhagia, haematuria and various malignancies were excluded from the study.

Anthropometric measurements:

Height, Weight, Body Mass Index, and Waist Hip Ratio.

Estimation of Haemoglobin

Haemoglobin was estimated by sahli's acid haematin method. The graduated haemoglobinometer tube was filled to the mark '10' on the percentage side with N/10 HCL (Hydrochloric acid, LOT NO- 4000009503, Mfg. Date:16-09-2012, Exp. Date: 16-09-2017; manufactured by Span Diagnostics Ltd; Surat, India).Then 20 µl of blood was drawn into the haemoglobinometer pipette and added into it. After 10 minutes, Distilled water was added at regular intervals drop by drop until the color matched with that of the standard color side bars in a comparator. The readings were taken as gram percent directly from the graduated tube.

STATISTICAL ANALYSIS

The results were analyzed by statistical software Statistical Package of Social Sciences (SPSS). All data were expressed in mean ± standard deviation. Students 't' test was used to compare the mean values of study group.

FINDINGS

In the present study, 50 untreated sputum positive patients of pulmonary tuberculosis and 50 controls were studied for haemoglobin values. The patients were given appropriate anti -tuberculosis therapy and again followed up after 2 months and 6 months. 14 patients did not turn up for haemoglobin estimation after two months and 21 patients after six months. Out of 50 cases, 5 cases (10%) had minimal lesion, 25 cases (50%) had moderately advanced lesion and 20 cases (40%) had far advanced lesion. Again of the total cases, 31 (72%) had cavitatory and 14 (28%) had non- cavitatory lesion.

Table 1: Age and sex distribution in study and control groups.

	Age in years	Male	Female	Total
Study Group	17 – 27	11	1	12
	28 – 38	14	6	20
	39 – 49	6	5	11
	50 – 60	3	2	5
	61 – 70	2	0	2
	Sex distribution	36	14	50 (total no of patients)
Control Group	Sex distribution	35	15	50 (total no. of controls)

In study group, out of 50 patients, 36 were males and 14 were females. The age group is varied from 17 – 70 years. The maximum numbers of patients were within the age group of 17 – 49 years. In control group, 35 were males and 15 were females.

Table 2: Percentage of different types of anaemia in pulmonary tuberculosis patients at different stages of treatment.

Type of Anaemia	Cavitatory lesion	Non -cavitatory lesion	Total	% (Percent)
(a) At the time of admission				
Normocytic normochromic	28	4	32	64
Normocytic hypochormic	3	2	5	10
Microcytic hypochromic	2	0	2	4
(b) 2 Months after therapy				
Normocytic normochromic	7	2	9	18
Normocytic hypochromic	0	0	0	0
Microcytic hypochrimic	0	0	0	0
(c) 6 months after therapy				
No patient showed any type of anaemia				

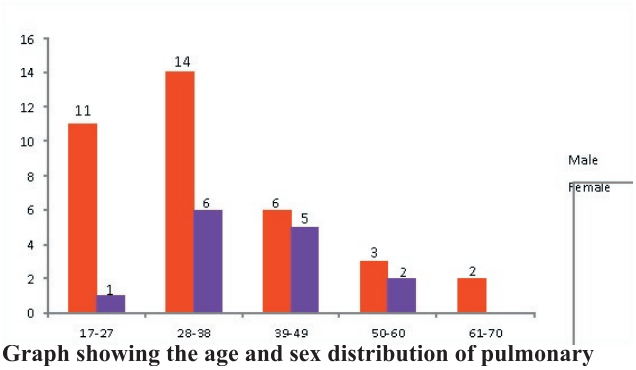
It was observed that out of 39 patients (78%) with anemia at the time of admission, 32 patients had normocytic normochromic anemia, 5 patients had normocytic hypochromic aneameia and 2 patient had microcytic hypochromic anemia. 2 months after therapy, only 9 patients (18%) still had normocytic normochronic anemia. 6 months after therapy, all patients were improved and no anemia had been found in any case.

Table 3: Haemoglobin values at different stages of treatment in study group and control group.

	Hb level at different intervals of therapy	**No. of patients**	**Hb levels in gm/dl**		**'p'**
			Range	**mean±S.D**[*4]	
study Group	At the time of admission	50	7 – 13.9	10.10 ±1.73	<0.0001 [H S][*1]
	2 months after therapy	36	8 – 14.2	12.11 ± 1.57	0.0015 [S][*2]
	6 months after therapy	29	12 – 14.6	13.40±0.16	0.15 [NS][*3]
Control Group	Base line	50	10 – 15.2	13.07±1.14	>0.0001 [NS]

[*1]HS- highly significant, [*2] S – Significant, [*3] NS – Not Significant, [*4] SD – Standard Deviation.

The table 3 shows the result of 't' test done between Mean Hb values at the time of admission, after 2 months and 6 months of therapy, and control group. From the table it can be said that mean Hb was highly significant ($p<0.0001$) at the time of admission and significant ($p=0.0015$) after 2 months of chemotherapy. It was not significant ($p=0.15$) after 6 months of therapy indicating that Hb values are reaching the range as in control group (Mean Hb after 6 months of therapy = 13.40 and Mean Hb in control = 13.07. this difference was statistically not significant).



Graph showing the age and sex distribution of pulmonary tuberculosis patients

DISCUSSION

Corr et al[5] and Cameron et al[6] had reported low level of haemoglobin in their works. In this study, 8 cases (16%) had normal haemoglobin level and 42 cases (84%) had haemoglobin below normal range. Patients with far advanced lesion and cavitatory lesion had lower haemoglobin level as compared with minimal lesion who had normal haemoglobin value. Haemoglobin and haematocrit are usually normal unless a prolonged period of illness has produced anaemia of chronic infection (Bates),[7] but severe anaemia is not a feature, which is usually seen with tuberculous ulceration of gut or with recurrent haemorrhage (crofton) [8]. In the present study 39 patients (78%) had mild to moderate degree of anaemia, 11 patients (22%) had normal haemoglobin level and no anaemia. No patient was found to be suffering from severe anaemia. Glasser et al[9] observed the incidence of anaemia in 63% cases, comprising of patients of different varieties of tuberculosis. Das et al[10] reviewed cases of pulmonary tuberculosis and observed anaemia of same severity as high as in 70% of cases. The present study comprising of cases of pulmonary tuberculosis only, shows anaemia in 84% cases. The high incidence of anaemia in this study, might be due to extensive and cavitatory lesion or due to associated malnutrition in the population studied.

In the present study, 19 of total 20 cases with far advanced lesion and 22 of total 25 cases with moderately advanced lesion had mild to moderate degree of anaemia. It appears that the extent of lesion has no relation with severity of anaemia. No incidence of anaemia is seen in minimal lesion. The anaemia was normocytic and normochromic in majority (64% out of 78%) of cases. Chapman[11] noted normocytic normochromic anemia in 84% of their series. All their 62 cases were generalized miliary tuberculosis. Sinha[12] studied 20 cases of disseminated tuberculosis and found normocytic normochromic anemia in most of the cases. This type of anaemia was frequently observed by wintrobe[13].

Cartwright observed microcytic hypochromic anaemia in 25% of cases. In this study normcytic hypochromic anaemia and microcytic hypochromic anaemia were observed in 9.7 % and 3.2% cases respectively. Peripheral smear also showed normocytic hypochromic picture in 5(10%) cases and microcytic hypochromic picture in 2(4%) cases. All cases were having far advanced and mostly cavitatory lesions. This type of anaemia is probably due to altered iron metabolism occurring in pulmonary tuberculosis[15,16]. In comparison to others, the incidence of hypochromic anaemia is less in the present study, probably due to exclusion of cases with too frequent haemoptysis.

CONCLUSION

It was concluded from our present study that a significant improvement of anaemia occurred in these patients after 2 months and 6 months of chemotherapy without administration of haematinics. Improvement from anaemia was correlated with the treatment of infection. Therefore, estimation of haemoglobin value is a good marker of progression in chemotherapy of pulmonary tuberculosis. During follow up period it was observed that with improvement in the diseased condition, the Mean Hb value reached the normal range.

Conflict of Interest: Nil

Source of Funding: Self financed

Ethical Clearance: Permission was taken from institutional research and ethical committee.

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Effect of Life Style Changes on Cardiovascular Autonomic Function

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ABSTRACT

Autonomic function is influenced by obesity and life style factors. Emotional stress, anxiety ,smoking ,alcohol tend to increase sympathetic activity and on the other hand meditation, yoga and other relaxation techniques increase vagal tone and reduces blood pressure and heart rate.[1] The autonomic nervous system, though previously thought as part of the nervous system that cannot be controlled, now a days it is seen that with help of yoga meditation and other relaxation technique it can be controlled.[2] Because of its participation in the pathologic process like sudden death, ischemic heart disease, coronary artery disease, the importance of studying autonomic function has grown over years

Objective: To establish the relation of life style modification on cardiovascular autonomic function .

Material and Method: The study was carried out among 200 staff of Gauhati Medical College in the age group 20 to 58 years.

Life style of all the 200 cases was determined..Life style is defined as the way people live, reflecting whole range of social values, attitudes and activities is composed of cultural and behavioral patterns and life long personal habits that have developed through process of civilization.

Mainly two types of life style were assessed.

ACTIVE LIFESTYLE- Regular exercise program with sufficient period of rest at night and diet rich in fresh fruit and vegetables, but low in saturated fats and simple carbohydrates .

SEDENTARY LIFE STYLE-Lack of exercise, obesity, smoking alcoholism and diet rich in saturated fat

For parasympathetic function]

1. Deep breath test, 2. Valsalva test

For sympathetic function

1. Hand grip test; 2. Orthostatic hypotension test

Results: In comparison to sedentary life style the parasympathetic activity was significantly increased in active life style valsalva ratio p value<.05.

Though sympathetic functions were raised in sedentary life style it was not found to be statistically significant.

Conclusion: In today's world of anxiety and stress it is seen that meditation and yoga and other stress relaxation techniques help reduces heart rate and blood pressure. Sedentary life style and unhealthy food habits increases sympathetic tone and greatly increase risk of cardiovascular diseases. So modification of life style is essential for prevention of cardiovascular accidents

Keywords: *Sympathetic, Parasympathetic, Lifestyl, Active Sedentary*

INTRODUCTION

Chronic imbalance of the autonomic nervous system is a prevalent and potent risk factor for adverse cardiovascular events, including mortality. Although not widely recognized by clinicians, the risk factor is easily accessed by measure such as resting and peak exercise and heart rate recovery, after exercise and heart rate variability.[5]

Activation of the sympathetic nervous system can be expected to have to have an adverse effect on these measures.Any factor tht leads to in appropriate activation.[6] The autonomic nervous system though previously thought as the part of the nervous system that cannot be controlled now a days it is seen that with help of yoga, meditation and other relaxation technique it can be controlled.[7]

Life style modification has achieved beneficial cardiovascular effect in patients with coronary artery disease .In studies done earlier patients who were adhered to a program of comprehensive lifestyle changes for 1to 4 years improved symptomatically and angiography revealed modest regression of coronary artery stenos is. Recent studies on less intense cardiac catheterisation.[7]

Indicate that after completion of such program beneficial changes was seen in autonomic function .It was seen that life style modification results in beneficial change of the combined systolic and diastolic blood pressure -

Change of the combined systolic and diastolic blood pressure -

AIMS AND OBJECTIVE

The present study was done to establish the effect of life style changes on cardiovascular autonomic function

MATERIALS AND METHOD

Life style of all the 200 cases was determined.

Life style is defined as the way people live, reflecting whole range of social values, attitudes and social activities.

It is composed of cultural and behavioral pattern and lifelong personal habits that has developed through process of socialization

Mainly two types of life style were assessed-

[1]ACTIVE LIFESTYLE

[2]SEDENTARY

ACTIVE LIFESTYLE-Regular exercise program with sufficient period of rest at night and taking diet rich in fresh fruits and vegetables, but low in saturated fats and simple carbohydrates.

SEDENTARY LIFESTYLE - Lack of exercise, obesity, smoking, alcoholism and diet rich in saturated fats.

The BP was measured using a sphygmomanometer.

The subjects were requested to come to the department at 9 am after having light breakfast and to abstain from tobacco or caffeine beverage that day. The subject was made to lie supine in an examination bed large enough to support the subject's entire body. So that he or she was completely relaxed.

For parasympathetic function deep breath test and valsalva test were performed. For sympathetic function hand grip test and orthostatic test were done.

RESULT

Table -1: Study of different Autonomic Function Tests According to Life Style

Life style	No of cases	Valsalva test			Deep breath test/ (beats/min)			Hand grip test(mm Hg)			Orthostatic test (mm Hg)		
		Mean	SD	SE	Mean	SD	SE	Mean	SD	SE	Mean	SD	SE
Active	150	1.53	0.022	(7.919)-04	19.76	4.25	0.309	9.03	2.37	0.17	18.28	4.06	0.292
Sedentary	50	1.47	0.0821	0.031	18.5	4.72	1.815	9.2	3.36	1.407	21.14	3.02	1.61

Table -2: Comparison of Different Autonomic Function Tests Between Active and						
	Sedentary Life style					
Test	**Total no of cases 150**	**Active**	**Total no of cases 50**	**Sedentary**	**Significance**	**P'Value**
		Mean±SD		Mean±SD		
Valsalva ratio	1.53±0.022		1.47±0.0821		Significant	<0.05
Deep breath test	19.76±4.25		18.50±4.72		Not significant	>0.05
Orthostatic test	9.03±2.37		9.20±3.36		Not significant	>.05
Hand Grip test	18.28±4.06		21.14±3.02		Not significant	>.05

From table 2 and it was seen that mean values of valsalva ratio of sedentary life style was 1.53

And 1.47 respectively and standard and standard deviation are.022 and .0821 and standard error were [7.919]-04 and .031

So it was seen from mean value of valsalva ratio in sedentary life style was less than that of active life style. Parasympathetic activity of sedentary lifestyle was less than that of active life style.

It was seen that there was no statistically significant difference of valsalva ratio between active sedentary life style. P value>.05

From table 1 it was seen that mean value of deep breath test was less compared to that of active life style. The parasympathetic activity in sedentary life style was decreased

From table2 it was seen that there was no significant difference of deep breath between active and sedentary life style P value >.05 and sedentary life style P value>.05

From table2 it was seen that mean value of orthostatic test of active and sedentary life style were .03mmHg, 9.03mmHg respectively and standard deviation 2.37 and 3.66

So it was seen from mean value of orthostatic test in active and sedentary life style was more or less same.

The mean value of orthostatic test of both active and sedentary life style were within normal range .

But there was no statistically significant orthostatic test between active and sedentary style.

It was seen from table2 that mean value of hand grip test of people of active and sedentary life style was 18.28mmHg, 21.14mmHg,

So it was seen from mean value that hand grip test that rise of diastolic BP and hand grip test was more in sedentary people though they were not statistically significant P value>.05

Sympathetic activity was more in sedentary life style compared to that of active life style.

DISCUSSION

The present study was carried out on 200 staff members of Gauhati Medical College.

In the results and observation mean value, standard deviation test of all the parameter were calculated.

In a study done by Jyotsna R –Bhaskaran et ell in 2001,valsalva ratio is more in yoga practitioner than normal people [9]

There is increased parasympathetic tone in yoga practitioner.

In another study done by Nandini Kapur found significant change in parasympathetic.[10]

Parameter like valsalva ratio showed an increase in ratio after doing relaxation technique .

In 2003, Asha Srivastava found in people doing physical exercise that parasympathetic activity as evaluated by valsalva ratio showed an increase in respond though not significant.[6]

In 2002, Brian M Curtis found that lifestyle modification like exercise ,meditation ,leads to increase in parasympathetic activity and reduction in sympathetic activity.[8]

The same idea was supported by in 2004 by Rajesh K . Sharma who found that regular physical training causes a decrease in sympathetic tone and increase in parasympathetic tones[9]

It was seen that mean value of valsalva ratio was increased in active life style compared to that of sedentary life style .

So the parasympathetic activity was more in people of active life style compared to that of sedentary lifestyle .

When compared with "t" test the valsalva ratio between active and sedentary life style though it was found to be statistically significant,P value<.05

So the present study go in favor of findings done by other authorsaccording to Nandini Kapur,2003 significant improvement was found with deep breadth test after relaxation training program me in the students who did meditation practice][11]. But according to another study done by Rajesh K Sharma in 2004 deep breadth test showed no significant difference between trained and untrained person[8]

It was seen that mean value that orthostatic test of active and sedentary life style are more less same

Comparative analysis done with the help student t test showed no significant difference in orthostatic test between active and sedentary life style .

According to study done by M Curtis in 2002,regular exercise reduces blood pressure and sympathetic activity with mild hypertension.

In a study done by Vijaylakshmi P,it is seen sympathetic activity it is reduced after yoga training[9]

And presser response to emotional and physical stimuli become less exaggerated

In another study done by Rajesh K. Sharma 2004, he found that diastolic blood pressure after hand grip showed a decrease after physical training[10]

In the present study the mean value of difference diastolic blood pressure in hand grip test showed a decrease after physical training

CONCLUSION

In presence of modern treatment comprehensive life style modification provides no additional benefit on progression of atherosclerosis but improves autonomic function.

So from present study the parasympathetic function which was assessed by valsalva ratio and deep breath test was decreased in sedentary life style compared to that of active life style.

Which is often ignored by the clinicians is very essential for cardiovascular health and prognosis.

Importance should be given to regular exercise,med itation,weight loss and reduction of mental stress. These factors augments vagal tone and improve outcome

Conflict of Interest- There is no conflict of interest

Ethical Clearance- Ethical clearance taken.

Source of Funding- Self

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A Comparative Study of Serum-Ascitic Fluid Albumin Gradient (SAAG) and Ascitic Fluid Total Protein (AFTP) as a Diagnostic Parameter in Patients Having Ascites

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ABSTRACT

Ascites is a manifestation of various number of diseases and the aetiopathogenesis of ascites is varied. The differential diagnosis of ascites remains a clinical problem. Although cirrhosis is the cause of ascites in most patients (80%), approximately 20% have a cause other than liver disease. Approximately 5% of patient with ascites have more than one cause (i.e. 'mixed' ascites). The present study was conducted on 75 consecutive patients admitted to indoor wards, Department of Medicine, Mayo Institute of Medical Science, Barabanki (UP), between June 2015 to May 2016 of age group 18–70 years having clinical symptoms and signs of ascites. Samples of blood and ascitic fluid were obtained simultaneously. The aim of present study was to evaluate various parameters especially serum ascitic fluid albumin gradient in case of ascites in an Indian setting and to compare the SAAG with the AFTP levels in terms of usefulness in establishing a cause of ascites. In the present study value of SAAG was 1.56 ± 0.37 gm/dl (mean ± standard deviation) for patients with portal hypertension related ascites whereas for non – portal hypertension related ascites excluding cardiac ascites SAAG was 0.95 ± 0.14 gm%. Corresponding values for cirrhosis and cardiac ascites were 1.6 ± 0.39 gm/dl and 1.44 ± 0.21 gm/dl respectively. It was observed that SAAG in cardiac ascites group (even though placed in non portal hypertension related ascites group based on absence of portal hypertension) resembled the SAAG of portal hypertension related ascites group. It was concluded from our present study that serum ascitic fluid albumin gradient(SAAG) is a better diagnostic parameter than ascitic fluid total protein (AFTP) in the patients having ascites. During the study we observed that SAAG has greater sensitivity and specificity values in comparision to AFTP for detection of portal hypertension related ascites.

Keywords*: Ascites, Serum-ascitic fluid albumin gradient(SAAG), Ascitic fluid total protein (AFTP)*

INTRODUCTION

Ascites is a manifestation of various number of diseases and the aetiopathogenesis of ascites is varied. The differential diagnosis of ascites remains a clinical problem.

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Although cirrhosis is the cause of ascites in most patients (80%), approximately 20% have a cause other than liver disease. Approximately 5% of patient with ascites have more than one cause (i.e. 'mixed' ascites). Usually the patients in this category have cirrhosis plus one other cause such as peritoneal carcinomatosis, hepatocellular carcinoma or peritoneal tuberculosis etc.

Traditionally two basic types of ascites have been recognized depending upon the postulated mechanism of formation of ascites- transudative and exudative. Ascitic fluid accumulation associated with increased hydrostatic pressure, reduced serum oncotic pressure or both are called transudative. In the formation of transudative ascites the two important factors are the plasma colloid osmotic pressure (PCOP) and the portal

venous pressure (PVP). The PCOP depends mainly upon the serum albumin and to some extent also on serum globulin. Portal hypertension serves to localize the fluid in the peritoneal cavity rather than in the peripheral tissues. Ascites formed as a result of increased capillary permeability is called exudative. It is associated with diseases of the peritoneum or peritoneal inflammation. The hemodynamic factors described above do not play an important role in the formation of exudative ascites although they do affect the composition and volume of ascitic fluid even in exudative ascites. The fundamental characteristics of these two varieties were listed by Foord[1] and by many others since then including Gilligan et al[2], paddock[3], Rovelstad[4] , pillary[5] and more recently Light[6], Boyer[7], Greene et al[8], Bar – meir et al[9] and Wilson et al[10]. Ascites in conditions where more than one disease process simultaneously co – exist is called mixed ascites e.g. in liver cirrhosis with abdominal tuberculosis, liver cirrhosis with superimposed malignancy etc. Serum ascitic fluid albumin gradient (SAAG) has been proved in multiple studies to categorize ascites better than the ascitic fluid total protein (AFTP) concentration and is also better than other parameters. The SAAG is based on oncotic hydrostatic balance and correlates directly with portal pressure. The present study was undertaken to evaluate various parameters especially serum ascetic fluid albumin gradient in case of ascites in an Indian setting and to compare the SAAG with the AFTP levels in terms of usefulness in establishing a cause of ascites.

MATERIALS AND MEHTOD

The present study was conducted on 75 consecutive patients admitted to indoor wards, Department of Medicine, Mayo Institute of Medical Sciences, Barabanki (UP), between June 2015 to May 2016 of age group 18–70 years having clinical symptoms and signs of ascites.

The patients who were detected incidentally by clinical examination or by ultrasonography and some patients developed ascites during the course of treatment for another disease in the ward also included. The patients who had received diuretic therapy or undergone therapeutic paracentesis within 3 months prior to admission were excluded from the study. Based on these criteria, 10 patients were excluded from the study. So ultimately the study was carried out with 65 patients.

Anthropometric measurements:

Height, Weight, Body Mass Index and Waist Hip Ratio.

Sample collection:

An attending physician in Medicine ward evaluated all patients. Samples of blood and ascitic fluid were obtained simultaneously. 5ml of blood was drawn from the antecubital vein and 50 ml of ascitic fluid was taken out with aseptic precaution through a sterile needle placed one inch lateral to the middle of right spino-umbilical line. The standard paracentesis technique was used. Determination of the concentration of albumin in both serum and ascitic fluid was determined using the Bromocresol Green method. With these results, the SAAG was calculated by subtracting the ascitic fluid albumin from serum albumin values. AFTP was estimated by using a standard Biuret method for proteins and special investigations included Ultrasonography of abdomen and pelvis, Echocardiography in cases of cardiogenic ascites and Liver Biopsy in cases of cirrhosis of liver.

The patients were grouped into two major divisions - portal hypertension related ascites (PHRA) and non – portal hypertension related ascites (NPHRA) respectively. The classification was adopted from the study conducted by Hurtado et al[11]. These major divisions were further sub grouped according to aetiology.

Statistical analysis:

All data were expressed in Mean ± standard deviation (SD). The analysis was performed using Graphpad instat prism 7. The Chi-square test was used to compare SAAG and AFTP of patients having ascites. The statistical significance accepted at $p<0.05$. The comparison among SAAG and AFTP were performed by two tailed students ‘t’ test.

OBSERVATIONS AND RESULTS

Table 1: Showing Albumin levels in Serum & Ascitic Fluid and SAAG in different aetiologies of Portal Hypertension Related Ascites group (PHRA)

Group no.	Aetiology (portal hypertension related Ascites)	No. of patients (n=45)	Albumin		
			S* (gm%)	A** (gm%)	SAAG (gm%)
1	Cirrhosis (uncomplicated)	31	3.09	1.49	1.6
2	Malignancy with liver involvement	6	3.63	2.08	1.53
3	Cirrhosis with congestive cardiac failure	1	2.9	1.4	1.5
4	Bacterial peritonitis with cirrhosis	4	2.92	1.32	1.6
5	Tubercular peritonitis with cirrhosis	3	3.13	1.93	1.2

*S-Serum **A-Ascitic fluid

Table 2: Showing Albumin Levels in Serum & Ascitic Fluid and Serum – Ascites Albumin Gradient in different aetiologies of of Non- Portal Hypertension Related Ascites group (NPHAR)

Group no.	Aetiology (Non-portal hypertension related Ascites)	No. of patients (n=20)	Albumin		
			S(gm%)	A (gm%)	SAAG (gm%)
1	Myxedema	1	2.3	1.3	1.0
2	Pancreatitis	1	3.6	2.7	0.9
3	Malabsorption + Hypoproteinemia	1	2	1	1.0
4	Renal disease	3	2.1	1.2	0.9
5	Malignancy without hepatic involvement	3	3.17	2.27	0.9
6	Bacterial peritonitis (pyogenic)	1	3.3	2.4	0.9
7	Tubercular peritonitis	4	2.65	1.67	0.98
8	Tubercular peritonitis with congestive cardiac failure (CCF)	1	2.8	1.6	1.2
9	Cardiac ascites	5	6.48	3.54	1.44

Table 3: Showing Mean and Standard Deviation (SD) of Serum – Ascites Albumin Gradient (SAAG) in different groups

Group	No. of Patients	S – A Albumin Gradient (gm%) (Mean ±SD)
Portal hypertension related ascites (PHRA)	45	1.56±0.37
Non – portal hypertension related ascites (NPHRA)	20	1.07±0.26
Non – portal hypertension related ascites excluding cardiac ascites	15	0.95±0.14
Pure cardiac ascites	5	1.44±0.21
Pure cirrhosis (uncomplicated)	31	1.6±0.39

Table 4: Showing Significance and Validity values of different Parameters

Aim	Parameter	Cut off value (gm%)	Sensitivity	Specificity	X^2 value	P value
To detect portal hypertension	SAAG	1.1	93%	87%	36.82	<0.001
	AFTP	2.5	73%	60%	5.46	<0.02

In this study, serum – ascites albumin gradient (SAAG) with a cut off value of 1.1 gm/dl (table4) was used to differentiate portal hypertension related ascites from non – portal hypertension related ascites. This parameter was also compared with the age old concept of ascitic fluid total protein (AFTP) with a cut off value of 2.5 gm/dl (table4) to categorize ascites as transudative or exudative. In the present study value of SAAG was 1.56± 0.37 (mean ± standard deviation) (table 3) for patients with portal hypertension related ascites whereas for non – portal hypertension related ascites excluding cardiac ascites SAAG was 0.95±0.14 (table3). Corresponding values for cirrhosis and cardiac ascites were 1.6± 0.39 and 1.44 ± 0.21 respectively (table3). It was observed that SAAG in cardiac ascites group (even though placed in non portal hypertension related ascites group based on absence of portal hypertension) resembled the SAAG of portal hypertension related ascites group.

DISCUSSION

Rector et al[12] compared SAAG with the AFTP in the separation of transudative and exudative ascites. The SAAG value was more in patients with transudative ascites (1.6 ± 0.5 gm/dl) and less in patients with exudative ascites (0.6 ± 0.4 gm/dl) with P<0.001 and provided significantly better discrimination of these categories than did the ascetic fluid total protein concentration. Runyon et al[13] in 1992 performed a study taking a total of 901 serum and ascitic fluid samples from patients with all forms of ascites and found that SAAG correctly differentiated causes of ascites due to portal hypertension in 96.7% of cases from those were not due to portal hypertension against AFTP (in 55.6% of cases). They concluded that exudate- transudate concept should be discarded in the classification.

Alba et al [14], studied the usefulness and diagnostic limitations of SAAG and concluded that SAAG should replace the ascitic fluid total protein concentration as the initial test to classify ascites. They found that and an elevated SAAG (≥1.1 gm/dl) correlated well with portal hypertension.

Laudanno et al[15] found that SAAG classified the causes of ascites correctly in 95.7% of cases compared to AFTP (in 65.6% of cases). They concluded that SAAG was better than the traditional exudate transudate concept in the classification of ascites. Akriviadis et al[16] In 1996 compared SAAG with ascites fluid total protein, ascites/serum protein ratio, ascites LDH concentration and ascites/serum LDH ratio. The diagnostic accuracy was 98% for SAAG compared with 52 – 80 % for the four other markers tested. In patients with infected ascites, diagnostic accuracy was 89% for SAAG and <50% for other four markers. They concluded that classification of ascites should be based on SAAG rather than exudate - transudate concept. Dillirichs et al in 2001 reported a significant correlation between the serum albumin gradient and the hepatic venous gradient, indicating the reliability of the serum - ascites albumin gradient in demonstrating the presence of portal hypertension and its relationship with the origin of ascites. Mene A , sharma D et al[17] in 2003 also found a correlation between serum ascites albumin concentration gradient with gastrointestinal bleeding in patients of portal hypertension.

CONCLUSION

It was concluded from our present study that serum ascitic fluid albumin gradient(SAAG) is a better diagnostic parameter than ascitic fluid total protein (AFTP) in the patients having ascites. During the study we observed that SAAG has greater sensitivity and specificity values in comparision to AFTP for detection of portal hypertension related ascites.

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Effect of Electromagnetic Radiation Emitted from Mobile Phone on Electrocardiographic Variables and Rate Pressure Product

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ABSTRACT

Recently peoples are concerned with safety of electromagnetic waves (EMW) emitted from mobile phone (MP) because neurological, degenerative, and heart diseases have been reported to be related with the use of MP. So, it is planned to study the effect of EMW emitted from MP on QT interval variables of electrocardiogram (ECG). Study was carried out in 15 healthy male subjects in the age group of 18-40 years. They were divided into two groups, i.e., MP nonuser group and MP user group. ECG was recorded in lead II for 5 min before and after listening to MP (1800 MHz frequency, band GSM type, model Panasonic GD75) which was held near to ear for a period of 30 min in on position on polyrite D system. On observing the acute effect of EMW emitted from MP, in MP non user group, R-R interval ($P < 0.001$), QTc ($p<0.05$), P wave duration ($p<0.001$) and RPP were reduced ($p<0.001$), whereas R-R interval was reduced ($p<o.oo1$) and RPP was raised ($p < 0.001$) in MP user group.

When subjects of nonuser group were compared with the subjects of user group in resting basal conditions, i.e., before exposing them to the MP, R-R interval ($p < 0.05$) was found to be increased, P-R interval was decreased ($p<0.05$) with non significant alteration in QRS, QTc, P wave, R wave, T wave duration and RPP in user group.

When nonuser group was compared with user group after exposure to electromagnetic waves, (acute on chronic effect), R-R interval and RPP were increased ($p<0.001$) without any effect on other parameters in user group. So, it is concluded that EMW emitted from MP may affects the ECG variables.

Keywords: *Mobile phone, Electromagnetic waves, QT interval, ECG variables.*

INTRODUCTION

Mobile phone (MP) is a wireless communication product of daily life. Electromagnetic waves (EMW) emitted from MP produce not only the neurologic symptoms i.e., sleep disturbances, memory problems, headache, nausea, vomiting, and dizziness, but also changes in electrocardiographic activity, blood pressure, and reaction time[1]. The cardiac electrical activity, i.e., electrocardiogram (ECG) in which QRS complex and J wave, ST segment, T and U waves represent ventricular depolarization and repolarisation respectively. Since the QT interval of ECG is an indirect measure of both myocardial depolarization and repolarisation[2] and reveals heterogeneity of repolarisation with consequent possibility of sudden death[3]. EMW emitted from MP might interfere with cardiac electrical phenomenon. So it was planned to study the effect of EMW emitted from MP on QT interval parameters of ECG, i.e., R-R interval; QRS interval; QTc interval; P- R interval; P, R, and T waves duration; and, the rate pressure product (RPP)[4] in MP nonusers and users.

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MATERIAL AND METHOD

Study was carried out in 15 healthy male subjects in the age group of 18- 40 years (mean age - 28.3 ± 4.7)

divided into two groups:

1. MP nonuser (Group I)

2. MP user (Group II) (using the MP for the last 5-8 years and per day exposure was > 30 min / day).

Subjects having hypertension, cardiac disease, diabetes mellitus, acoustic disorders, and computer professionals were excluded from the study. The written consent was taken from each subject. ECG was recorded by lead II for 5 min. (basal) on polyrite D system. Exposure to EMW was done by listening to MP - 1800 MHZ frequency, Band GSM Type, Model Panasonic GD75, placed near to ear for 30 min. in on position. Specific Absorption Rate (SAR) was 0.669 Watt / Kg averaged over 10 gm of tissue. Non exiting topics were made to listen. The study was approved by local ethical committee. Recording was taken around 10 A.M. All subjects were abstained from consuming caffeinated beverages, smoking and physical activity 12 hours preceding the procedure. Subjects were asked to take at least 15 min rest before the procedure to avoid any effect of anxiety. Precaution was taken that no disturbances occurred from incoming calls and messages, and same mobile phone was used for all recordings[5].

After 30 min of MP exposure, ECG was again recorded for 5 min. Different variables of ECG, QTc interval and RPP were calculated before and after MP exposure. The groups were again divided into:

1. MP non user (Group I) --- Before exposure to MP.

After exposure to MP.

2. MP user group (Group II) --- Before exposure to MP.

After exposure to MP.

Blood pressure (BP) was recorded by sphygmomanometer. RPP was calculated as a product of heart rate (HR) and systolic BP divided by 100. Statistical analysis was done by applying paired and unpaired "t" test. A value < 0.05 was considered significant.

RESULT

All the subjects were nonsmokers and healthy. Anthropometric data are given in Table I. On comparison of before and after the MP exposure in MP non user group, R-R interval ($P < 0.001$), QTc ($p<0.05$), P wave duration ($p<0.001$), and RPP were reduced ($p<0.001$) after exposure to MP (acute effect). While in MP user group (who were already using MP), R-R interval was reduced (p<o.oo1), RPP was raised ($p < 0.001$) after the use of MP compare to pre exposure level.

On comparison of non user group with MP user group, before exposure to MP (basal level), R-R interval (p0.05) was found to be increased, P-R interval was decreased ($p<0.001$) with non significant alteration in QRS, QTc, P wave, R wave and T wave duration and RPP in user group (chronic effect) .

When MP nonuser group was compared with user group after exposure to electromagnetic radiation, R-R interval and RPP were increased ($p<0.001$), without any effect on other parameters in user group (Table II).

DISCUSSION

MP has now become an absolute requirement of daily life. Although MP produces thermal, autonomic, neurological, acoustic effects i.e., headache, giddiness, clicking sound in the ear, and blurring of vision, but in our study none of the subject complaints of such symptoms related to MP. Whole of the study was carried out in male subjects, in young age group to avoid effect of gender and age[6, 7]. It was demonstrated by Kamiya et al[8] that flexed position of forearm and hand grip exercise may increase sympathetic outflow. In this study we eliminated this factor by keeping the phone near to subject's head and keeping the hand straight. Utmost care was taken to keep the subject absolute immobile to eliminate movement factor[9].

R-R interval was found to be reduced in both the groups, i.e., nonusers and users after exposure to MP. It is in accordance with Shelke et al[10], who reported that HR increased during MP ring. Similarly even antenatal and postnatal maternal use of MP results in statistically significant increase in fetal and neonatal HR[11]. In contrast significantly lower arterial BP and HR is demonstrated in EMW exposed than non exposed persons[12]. While others did not find any change in arterial BP and HR during or after radiofrequency (RF) of 900 MHz cellular phones[13]. It is postulated that EMW affects the HR through central mechanism via brain structures that controls autonomic functions especially HR and heart rhythmicity[11]. It is also reported that change in HR and BP were independent of

EMW exposure from MP[14].

Electromechanical disturbance is usually implied by the presence of QRS prolongation, i.e., >120 ms, which has recently been recognized as an important prognostic factor and associated with cardiac dysfunction[15]. QRS duration was not affected by EMW emitted from MP in both users (although they were using the MP for last 5-8 years) and nonusers groups (basal). Even after the MP exposure, QRS was not found to be affected in both the groups. Prolonged QTc may hold independent prognostic importance in ischaemic heart disease (IHD), diabetes mellitus (DM), and increased risk of arrhythmia. But arrhythmia was not recorded in any of the subject in our study. Similar finding is also reported by other workers[15]. QT interval decreases less than R-R interval during standing induced tachycardia[16]. In our study also, there was no effect on QRS duration on exposure to EMW but R-R interval was decreased. Although effect on ECG is not much marked, but EMW may affect rhythmicity of heart[16].

In contrast, Fadel et al[17] described considerable alteration in ECG recordings from rats exposed to electromagnetic fields (EMFs). They found a change in ECG as an irregular pattern in QRS complexes, which may indicate destruction of cardiac muscles and /or local blocks in conduction of impulses by Purkinji fibers.

Duration of P wave was found to be reduced significantly ($p<0.001$) in non user group after the MP exposure, with no effect on R and T wave duration. Reduced P wave amplitude was described by Rezk and associates[11].

Other workers reported that MP has no effect on hemodynamic (HR, BP) and cardiac electrical activity (P wave and QT dispersion) parameters, when it is positioned on the chest in the immediate proximity to the heart and does not cause cardiac autonomic dysfunction in adult subject[18].

RPP is an index of myocardial oxygen consumption[4] and work load on the heart. It is found to be elevated significantly on exposure to EMW in user group indicating somehow these waves affects the cardiac activity. So it is concluded that the effects observed in nonusers and users groups were more or less similar after exposing them to EMV. But chronic exposure may cause some difference, which could possibly be increased on acute exposure to EMW, for which further long term studies would be required.

Designation of both authors already written.

Table I - Demographic data of mobile phone non users (Group I) and mobile phone users (Group II).

Parameter	Group I Mean ± SD	Group II Mean ± SD	P value
Age (years)	28.12 ± 5.6	26.3 ± 6.64	NS
Sex	Male	Male	
Height (meters)	1.68 ± 0.06	1.68 ± 0.07	NS
Weight (Kg)	70.1 ± 8.6	60.72 ± 10.1	NS
BMI (Kg/mtr^2)	24.62 ± 2.6	23.52 ± 3.2	NS
Duration of mobile phone exposure	Not used	2- 5 years	

NS: Non Significant

BMI: Body Mass Index

Table-II Comparison of ECG variables in Mobile Phone (MP) nonusers (Group I) and users (Group II) before and after MP exposure.

Variables	MP Nonusers		MP Users	
	Before MP	After MP	Before MP	After MP
R-R interval	0.825 ± 0.09	0.579 ± 0.08***	0.939 ± 0.17 α	O.896± 0.15***,®®®
P-R interval	0.213 ± 0.02	0.146± 0.03	0.127 ±0.04 ααα	0.130 ± 0.05
QRS interval	0.09 ± 0.01	0.09 ± 0.001	0.07 ± 0.01	0.073 ± 0.05
QTc interval	0.236 ± 0.13	0.173 ± 0.02*	0.170 ± 0.10	0.165 ± 0.09
P wave	0.087 ± 0.01	0.06 ± 0.005***	0.05± 0.02	0.67± 0.03
R wave	0.771± 0.30	0.702 ± 0.40	0.546 ± 0.33	0.538 ± 0.37
T wave	0.177± 0.09	0.09 ± 0.02	0.089 ± 0.66	0.104± 0.09
RPP	99.80 ± 18. 56	97.76 ±18.30	98.76 ± 19.33	114.13± 7.6***,®®®

P value :*< 0.05-significant, *** <0.001-very significant, in MP nonuser and MP user group before vs. after exposure to MP.

P value: α<0.05-significant, ααα <0.001-very significant, before exposure to MP in MP nonuser vs. user group.

P value: ®®® <0.001 - very significant, after exposure to MP in MP nonuser vs. user group.

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Influence of ABO Blood Groups on Activated Partial Thromboplastin Time

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ABSTRACT

Aims and Objectives: 1. To determine the Activated partial thromboplastin time in O blood group individuals and in non-O blood group individuals.

2. To compare the difference in APTT between O and non-O blood group individuals.

Materials and Method: 60 healthy volunteers in the age group of 18-20 years were chosen for the study such that 30 of them belonged to O blood group and 30 belonged to non-O blood groups.

Blood grouping was done by 'rapid slide method' and APTT was determined by manual method following the standard procedure.

The data obtained was subjected to statistical analysis using the 'T test.'

Results and Conclusion: Statistically significant difference ($p<0.05$) was found in the APTT values between O and non-O blood groups with a higher mean value in O blood group compared to non-O blood group. This may be due to the lower levels of FVIII in O blood group compared to non-O blood groups. Therefore, it is concluded that the procoagulant tendency seems to be more in non-O blood groups which is reflected by the lower APTT values found in them.

Keywords: *ABO Blood Groups, Activated Partial Thromboplastin Time (APTT), Coronary Artery Disease (CAD), Cardiovascular Disease (CVD), Factor VIII (FVIII), Venous Thromboembolism (VTE), Von Willebrand Factor (VWF).*

INTRODUCTION

Many studies have reported a relationship between ABO blood groups and risk of coronary heart diseases[1,2], atherosclerosis[3,4] and venous thromboembolic disease[5,6,7] and found an increased risk for all ABO phenotypes except type 'O'[1,2]. In fact type 'O' individuals seem to show lower coagulability[8] than A, B or AB individuals which may seem protective against cardiovascular diseases.

Lower levels of factor VIII (FVIII) and Von Willebrand Factor (VWF) have been reported in individuals with blood type O[9,10] compared to individuals with other ABO blood types. Since the relationship between vascular diseases and VWF and factor VIII is well known[11,12], the influence of ABO blood groups on VWF and factor VIII has been suggested as a potential mechanism for the association between ABO blood groups and cardiovascular diseases[13].

Although many studies have related ABO blood groups to the risk of CVD and VTE, hardly any effort has been made to relate the ABO blood groups to global coagulation tests such as the APTT which is a part of the standard screening tests for function of the coagulation system. This study may contribute to an important aspect of the ever growing interest in the ABO blood groups.

APTT is a performance indicator measuring the efficacy of both intrinsic and common coagulation pathways. Studies have shown that lower APTT may represent a procoagulant tendency[14,15].

APTT being a global coagulation test and a sensitive indicator of factor VIII activity (which in turn depends on VWF levels), has been chosen as a parameter to know the possible variation that can occur depending upon the blood group of the individual and reflecting the procoagulant tendency of ABO blood group types.

MATERIALS AND METHOD

STUDY DESIGN: Cross-sectional study.

PLACE OF STUDY: Osmania Medical College, Hyderabad.

METHODOLOGY

First ethical committee approval was obtained from the institutional ethical committee of Osmania Medical College.

Informed consent was taken from the volunteers and purpose of the study was explained along with risks and benefits.

SAMPLE SIZE:

60 volunteers including both males and females

INCLUSION CRITERIA:

- Healthy individuals in the age group of 18 - 20 years were taken as subjects from amongst undergraduate medical students of Osmania Medical College.

EXCLUSION CRITERIA:

- History of taking any drugs.
- Pathological conditions.

General information was obtained from the volunteers regarding their age, sex and health status.

INVESTIGATIONS PERFORMED

1. BLOOD GROUPING

PRINCIPLE:

This test is based on haemagglutination reaction. Human red blood cells possessing A and / or B antigen will agglutinate with the corresponding antibody.

REAGENT USED:

The reagent (anti-sera) kit for blood group testing was procured from Span Diagnostics Limited.

REAGENT KIT COMPONENTS:

- Spanclone ANTI-A Monoclonal
- Spanclone ANTI-B Monoclonal
- Spanclone ANTI-AB Monoclonal

SAMPLE COLLECTION AND PREPARATION:

Blood sample was obtained by finger puncture taking aseptic precautions and red cell suspension was prepared and tested immediately.

PROCEDURE

Rapid Slide Test:

1. The red blood cell suspension was used as the test sample.

2. Three circles were marked on a glass slide and labeled as A, B and AB.

3. One drop of the appropriate blood grouping anti-sera was placed at the above marked area.

4. One drop of red cell suspension was placed on each of the marked areas.

5. These were mixed well with separate applicator sticks and spread over an area of approximately 2 cm diameter. The slide was tilted back and forth for 2 minutes.

6. The slide was then observed macroscopically for the evidence of agglutination[17].

Confirmation was done under low magnification microscope, comparing each "test mixture" with its corresponding "control mixture"[16].

INTERPRETATION OF RESULT:

Positive: Agglutination indicates positive reaction

Negative: Absence of agglutination indicates negative reaction

Possible reactions with the monoclonal antibodies and their interpretations are shown in the following table:

Table 1: Interpretation of result of rapid slide test

REACTION WITH SPANCLONE ANTI-A MONOCLONAL	REACTION WITH SPANCLONE ANTI-B MONOCLONAL	REACTION WITH SPANCLONE ANTI-AB MONOCLONAL	BLOOD GROUP
+	-	+	A
-	+	+	B
+	+	+	AB
-	-	-	O

2. ACTIVATED PARTIAL THROMBOPLASTIN TIME

PRINCIPLE:

The test measures the clotting time of plasma after the activation of contact factors but without added tissue thromboplastin and so indicates the overall efficiency of the intrinsic pathway.

The test depends not only on the contact factors and on factors VIII and IX, but also on the reactions with factor X, V, prothrombin and fibrinogen. It is also sensitive to the presence of circulating anticoagulants and heparin[18].

REAGENT:

Liquicelin-E reagent, a liquid ready to use activated cephaloplastin reagent, has been used in this study to determine the APTT. It is a phospholipid preparation derived from rabbit brain with ellagic acid as an activator.

SAMPLE COLLECTION AND PREPARATION:

- No special preparation of the subject was required prior to sample collection.
- A 'clean' venipuncture was made taking aseptic precautions using a 20 gauge short needle fitted to a plastic syringe.
- 3.6 ml of blood was drawn carefully avoiding frothing of blood.
- The blood was transferred into tubes, after detaching the needle from the syringe.
- 0.4 ml of tri-sodium citrate (0.11 mol/l, 3.2%) was added to the blood sample as anticoagulant.
- The blood sample and the anticoagulant were mixed in a ratio of 9:1.
- The specimen was then centrifuged immediately at 3000 rpm for 15 min and the plasma was transferred into a clean test tube.
- Plasma was tested within three hours of blood collection.

PROCEDURE:

Manual method[19] was followed.

1. Volume of reagent required for immediate testing was aspirated from the reagent vial into a thoroughly clean and dry test tube and brought to room temperature before prewarming at 37ºC for testing purpose.

2. Required volume of calcium chloride solution was also taken in a separate test tube and brought to 37ºC over 5 to 10 minutes using a heating block at 37ºC.

3. 0.1 ml of test plasma was then taken into a test tube and 0.1ml of the reagent was added to it. The test tube was shaken briefly to mix the plasma and reagent and placed at 37ºC for 3-5 minutes.

4. Following the incubation period, 0.1 ml of prewarmed calcium chloride solution was added to the plasma and reagent mixture. A stop watch was started simultaneously.

5. The tube was shaken briefly to mix the contents and kept at 37ºC for 15 seconds.

6. Following the 15 seconds incubation, the tube was removed and gently tilted back and forth until a gel clot formed and the time in the stop watch was recorded.

7. Repeating the above steps a duplicate test was performed using the same test plasma.

8. Average from the duplicate test values was taken as the APTT value[19].

REFERENCE RANGE FOR APTT VALUES:

Reference range taken in this study for APTT was 25-35 seconds.

STATISTICAL ANALYSIS:

Statistical analysis comparing APTT values obtained in 'O' and Non-'O' Blood groups was done by "T test".

FINDINGS

TABLE 2: ANALYSIS OF APTT VALUES IN O AND NON-O BLOOD GROUPS

Variable	BG o		Std.Err.	Std.Dev.	BG NoN O		Std.Err.	Std.Dev.	T Test	Proba-bility		Mann Whitney	Proba-bility	
age	18.633	±	0.112	0.615	18.667	±	0.111	0.606	0.211	0.833		354.000	0.080	
sex	1.467	±	0.093	0.507	1.500	±	0.093	0.509	0.254	0.800		359.000	0.091	
aptt(sec)	31.300	±	0.319	1.745	29.600	±	0.252	1.380	4.186	0.000	***	209.000	0.000	***

Results showed that the mean APTT value was higher in the O blood group category (31.300 ± 0.319 seconds) when compared to the non-O blood group category (29.600 ± 0.252 seconds) and this difference was found to be statistically significant ($p<0.05$).

According to the T test the P value was found to be 0.0001 which is statistically very significant.

DISCUSSION

ABO blood group has emerged as the major genetic determinant of VWF levels in the plasma. Twin studies have demonstrated that 66% of all variations in plasma VWF are genetically determined, while 30% of them depend on ABO blood group[20], O blood group individuals having plasma VWF levels 25% lower than non-O subjects[21].

Although the mechanisms behind ABO blood group and VWF levels have yet to be fully clarified, it has been clearly demonstrated that the effects are mediated by the ABO antigen structures on the N-linked oligosaccharide chains of circulating VWF, and particularly by H antigen expression[22].Perhaps the ABO blood group determinants are affecting the processing or the release or catabolism of VWF thus influencing plasma concentration of VWF and also indirectly the plasma concentration of factor VIII, which is carried by VWF.

This relation between ABO blood groups and plasma levels of VWF and FVIII is of great clinical significance because it is the most widely accepted potential mechanism for the association between ABO blood group and risk of CVD. Many studies have shown that a relationship exists between vascular diseases and VWF or factor VIII and that VWF is related to venous thromboembolism[12,23,24], cerebral arterial disease[24,25], and coronary heart disease[2,26,27]. Factor VIII is also associated with coronary risk[2,27], ischemic cerebrovascular disease[25], and venous thrombotic disease[12,23]. ABO blood group may be only indirectly related to the risk of vascular disease through its influence on the plasma levels of VWF and FVIII.

Numerous studies have reported that individuals with non-O blood types had a higher risk of VTE compared to their O counterparts[5,6,7,28].

Therefore, ABO blood group is an important determinant of VWF and FVIII levels which in turn confer a clear risk of increased VTE with the higher levels seen in the non-O blood types. The associations are far less clear for CAD and MI but a similar pattern emerges with most studies finding group O to be at lower risk.

It is being increasingly appreciated that hypercoagulability is one of the triggers that may alter the balance of hemostasis, explaining the occurrence of VTE in individuals who are otherwise apparently healthy. Hypercoagulability may be due to the defective naturally occurring anticoagulant mechanisms or due to heightened levels of procoagulant factors. One of these procoagulant factors is FVIII belonging to the intrinsic pathway of blood coagulation which can be assessed by APTT being used over the last 50 years as a standard screening test in clinical laboratories throughout the world.

In this study, it was reasoned that an altered APTT may occur consequent to the variation in FVIII levels brought about by the influence of ABO blood groups on plasma VWF levels. A shortened APTT may reflect the procoagulant imbalance consequent to increased levels of FVIII and might be associated with an increased risk of VTE.

Thus, ABO phenotyping may be a valuable component of future diagnostic thrombophilia risk

profile and might have implications in the policy of thrombosis prophylaxis and treatment.

CONCLUSION

• From the results it is concluded that the procoagulant tendency is more in the non-O blood group category since it showed a lower mean APTT value which may explain the higher incidence of CVDs and VTE in this group.

• The practical implication of this study is that due to the differences found in the procoagulant tendency of the different ABO blood groups, ABO phenotype may be used to augment the quantitative clinical assays in defining a profile for thrombosis risk in an individual.

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NMDA Receptors and Memory of Pain

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ABSTRACTS

Background & Objective: NMDA is a receptor for the excitatory neurotransmitter glutamate, which is released with noxious peripheral stimuli. They are critical for the development of the central nervous system (CNS), generation of rhythms for breathing and locomotion, and the processes underlying learning, memory, and neuroplasticity. The activation of NMDA receptors has been associated with hyperalgesia, neuropathic pain, and reduced functionality of opioid receptors. Therefore, NMDA antagonists have a role in modulating pain. Ketamine is a strong NMDA antagonist. By blocking the receptors through antagonist ketamine given pre-emptively and postoperatively via epidural route in patients of lower limb amputation, its role in suppression of memory of pain is studied. **Methodology:** This study was conducted at Civil Hospital Ahmedabad during the year 2012-2015 with the permission of ethical committee of hospital and after written informed consent of 60 adult patients of age group 18- 60 years of either sex and ASA grade 1 or 2 posted for lower limb amputation. Patients were divided into three groups where one was administered epidural opioid and ketamine, the second group was epidural opioid only and in the third group epidural saline only. Pain scores of all the groups were compared. **Results:** Requirement of first dose of analgesia in group 1 is after 12.5±1.03hrs, in group 2 after7.6± 0.98 hrs and in group3 after 3.4± 0.8hrs and average duration between consecutive analgesic doses were 11.5hrs in group 1, 7.6hrs in group 2 and 4.5hrs in group 3 respectively. **Conclusion**: NMDA receptor antagonist is effective in management of acute post-operative pain compared to opioid analgesics alone as the time to first dose of analgesia is much larger in group 1 than 2 and 3. Ketamine has definitive role in opioid sparing effect as suppression of memory of pain. [Lamoria M NJIRM 2015; 7(1):1]

***Keywords**: NMDA receptor, pain, glutamate, opoid receptor.*

INTRODUCTION

NMDARs possess a combination of unique properties: (1) high affinity for the excitatory transmitter L-glutamate, (2) very slow kinetics of (de)activation, (3) pronounced voltage dependence due to external Mg block, (4) high permeability to Ca ions, and (5) large cytoplasmic domains that enable them to become part of and help organize large macromolecular synaptic signaling complexes.

The high affinity for glutamate and relatively slow (de)activation kinetics allow NMDARs to decode synaptic input patterns over prolonged periods. Ca ions entering through NMDARs act locally at signaling complexes associated with the receptor, to allow long-lasting modification of individual synapses. In addition to this highly localized action, activation of NMDARs in distal dendrites can signal to the nucleus to affect gene transcription. Finally, the regenerative properties of NMDARs allow them to help generate and propagate dendritic depolarizations, resulting in nonlinear processing of synaptic inputs that may endow neurons with novel computational abilities.

Long-lasting enhancement of synaptic strength (long-term potentiation, LTP) is an ubiquitous phenomenon of synaptic plasticity throughout the central nervous system and is believed to play a major role in learning and memory formation. The perceptual consequence of this use-dependent increase in the excitability of central nociceptive neurons is neurogenic hyperalgesia, i.e. an increase in pain sensitivity caused by the nociceptive input to the spinal cord rather than by tissue damage. If this sensitized state persists, it may contribute to chronic pain. These transcriptional and posttranslational changes can persist well beyond the initial peripheral stimulation and are major elements of a series of persistent changes described as central sensitization.

Based on these unique properties, it is not surprising that NMDAR hypofunction or overstimulation can result in many cognitive defects and brain dysfunction, making these receptors prime therapeutic targets.

Intervening at the NMDA receptor with an antagonist could have two desirable effects. First, it could improve pain management by interfering with the hyperalgesic mechanisms (central sensitization) that result from the activation of the NMDA receptor by injury. Second, by blocking or reversing morphine tolerance, an NMDA receptor antagonist will have an opioids-sparing effect and improve the efficacy of an opioid that is used to control the pain.

Pre-emptive analgesia, an evolving clinical concept, involves the introduction of an analgesic regimen before the onset of noxious stimuli, with the goal of preventing sensitization of the nervous system to subsequent stimuli that could amplify pain. Surgery offers the most promising setting for pre-emptive analgesia because the timing of noxious stimuli is known.

MATERIAL AND METHOD

This study was conducted at CIVIL HOSPITAL AHMEDABAD during the year 2012-2015 with the permission of ethical committee of hospital and after written informed consent of 60 adult patients of age group 18- 60 years of either sex and ASA grade 1and 2 undergoing lower limb amputation. 60 patients were randomly allocated in 3 groups (n=20). There were 20 patients in each group.

Epidural catheter is placed in every patient a day before surgery by anaesthesiologist.

Preoperative epidural drugs:

GROUP 1: Inj. ketamine 0.5mg/kg + Inj. buprenorphine 1µg/kg in 10ml saline

GROUP2: Inj. buprenorphine 1µg/kg in 10ml saline

GROUP3: inj. Normal Saline 10ml

Surgery was done under spinal anaesthesia in all 60 patients.

Postoperative data:

After completion of surgery and shifting the patient to post operative ward, patient's vitals, pain status, rescue analgesic requirement, adverse effect of drugs and sedation score were monitored and noted.

Pain was assessed by using VAS score.

At VAS 8 and above epidural dose is given. Four such doses are given and duration of analgesia is charted. Duration of analgesia is to be compared in both groups. After 4th epidural dose epidural catheter is removed.

In control group i.E. group 3 pain relief is done using nsaids: inj voveran 75 mg. Time, frequency and dose of drug are noted.

Patients were monitored for any adverse effects of epidural drugs.

RESULT

Table 1: Demographic data: age, sex and weight distribution.

Group	Age Mean± S.D.	Weight Mean ± S.D.	Sex M:F
Group 1	40.8 ± 16.05	50.45 ± 10.18	15:5
Group 2	37.25 ± 14.97	47.95 ± 7.70	16:4
Group 3	36.65 ± 14.60	50.05 ± 9.37	13:7

Table 2: Incidence of pre operative pain in three groups.

Group	Number of Patients
Group 1	8 (40%)
Group 2	7(35%)
Group 3	7(35%)

Table 3: Onset of block.

Group	Sensory Block	Motor Block
Group 1	7.6 ± 0.88	9.65 ± 0.98
Group 2	6.9 ± 0.85	8.8 ± 0.69
Group 3	6.9 ± 0.64	9.1 ± 0.58

Table 4: Time of first postoperative analgesic requirement.

Group	First Dose Requirement (Hrs)
Group 1	12.5±1.03
Group 2	7.6± 0.98
Group 3	3.4±0.8

Table 5: Duration of analgesia between 4 epidural doses in three groups.

Group	1-2 Dose Hrs	2-3 Dose Hrs	3-4 Dose Hrs	Average Duration (Hrs)
Group 1	12.5±1.6	11.1±1.5	11.5±.7	11.5 HRS
Group 2	7.6±0.9	7.8±0.8	7.4±0.8	7.6 HRS
Group 3	3.9±0.6	4.7±0.6	5±0.6	4.5 HRS

Table 6: Average number of rescue analgesic doses in 48 hrs.

Group	Average Rescue Analgesic Doses
Group1	0.4 ± 0.68
Group2	1.05 ± 0.75
Group3	5.35 ± 0.93

Table 7: Complications of epidural drugs.

Group	Nausea/ Vomiting	↓ BP	↑BP	↑ HR	↓HR	↓ RR	Psy. React.
Group1	6 (30%)	2 (10%)	-	-	-	-	2(10%)
Group2	4 (20%)	4 (20%)	-	-	-	-	-
Group3	-	-	-	-	-	-	-

Table 8: Incidence of phantom limb pain.

GROUP	1 MONTH	6 MONTH	12 MONTH
GROUP1	-	-	1 (5%)
GROUP2		-	1 (5%)
GROUP3	-	1 (5%)	1 (5%)

In this table we can see incidence of phantom limb pain is comparable in all the groups. So it is inconclusive to decide the effect of any drug over phantom limb pain from this study.

DISCUSSION

In normal tissue nociceptors are silent, when injury occurs nociceptors acquire new characteristics and are said to be sensitized: (1) They begin to discharge spontaneously. (2) Their threshold for activation is decreased such that normally innocuous stimuli now cause pain; a phenomenon called allodynia). (3) Their stimulus–response curves are shifted to the left, such that a noxious stimulus causes more pain than normal, a condition called hyperalgesia. Sensitized nociceptors also acquire an excitatory response to norepinephrine; thus, there is a link between pain and sympathetic nervous system discharge. In the case of neuropathic pain, nociceptors also change their characteristics. If their axon has been interrupted, the regenerating sprout may discharge spontaneously and become extremely sensitive to mechanical, thermal, and ionic stimulation. Unmyelinated (C-fiber) nociceptors release glutamate as their neurotransmitter. The spinal cord neurons that receive input from C-nociceptors express three subtypes of glutaminergic receptor: the N-methyl-D-aspartate (NMDA) subtype, the kainate/AMPA (l-amino- 3-hydroxy-5-methylsoxasole-propionic acid) subtype, and the metabotropic subtype. Glutamate released from C-nociceptors and acting at NMDA receptors evokes a change in the sensitivity of the postsynaptic cell such that it responds more strongly to all of its inputs, an effect called central sensitization.

Prevention of injury-induced functional alterations in the CNS by pre-emptive analgesia is a fascinating working hypothesis based on substantial scientific evidence.

Dr JA Wilson et al had studied the effect of pre-emptive analgesia with epidural ketamine in lower limb amputation patients in 53 patients. So I selected 60 patients randomly for my study and divided them into 3 groups of 20 patients each. I also chose epidural route for pre-emptive analgesia like their study. I chose buprenorphine for the study due to its long duration of action and high analgesic potency. Dr Takekazu Terai et al[25] (1994) in their study of effect of Lumbar epidural buprenorphine for post-operative pain relief following hepatectomy used buprenorphine in the dose of 0.06mg to 0.12 mg. The dose in this study is comparable to doses used by Dr Takekazu Terai et al[25] (1994) in their study and Dr Veena R Shah et al in their study. As early as 1985 Islas et al. injected a low dose (4 mg diluted in 10 ml 5% dextrose in water) of ketamine epidurally when the effect of lidocaine or bupivacaine had worn off and observed potent postoperative analgesia without respiratory depression or other side effects. However, they were not aware of the concept of pre-emptive analgesia and NMDA receptors at that time. Although the ability of NMDA receptor antagonists to suppress post injury hyperalgesia associated with peripheral inflammation or nerve damage was known to occur in experimental animals, it was not until 1993 that ketamine was used clinically as a pre-emptive analgesia. Since then several studies have shown pre-emptive analgesic action of ketamine with opioid either given intravenously or epidurally in different dosages.

Dr Veena R Shah et al[19] in their study used ketamine 1mg/kg. Dr C S Wong et al[20] in their study used ketamine 30 mg. Dr Y Y Chia et al[24] used 0.4 mg/kg ketamine, Dr Mohamed Naquib et al studied epidural ketamine for post-operative analgesia 30 mg ketamine. Dr M E Abdel Ghaffar et al[11], studied analgesic effect of epidural ketamine on post – operative pain & epidural PCA consumption after total abdominal hysterectomy with 30 mg ketamine. Dr Xie et al[23] studied, the analgesic effects & pharmacokinetics of a low dose ketamine preoperatively administered epidurally or intravenously with 0.5 mg/kg ketamine. In this study dose of ketamine was selected as 0.5mg/kg. So dose in this study is comparable to all the above studies.

Analgesic dose interval in my study in Group1 11.5hrs, Group2: 7.6hrs and in Group3: 4.5hrs respectively is comparable to study of Dr Veena R Shah et al[19] where duration of analgesia was 13.06hrs with inj. Buprenorphine + ketamine 30 min before skin incision and duration of analgesia in group 2 is comparable to study of Dr Takekazu Terai et al[25] where epidural buprenorphine alone produces 8 hrs analgesia. Time to first dose of analgesia was significantly prolonged in Group 1 compared to Group 2 and Group 3. And time to first dose of analgesia was significantly prolonged in Group 2 compared to Group 3. It shows the positive and additive role of ketamine in prolonging analgesia.

Psychosomatic reactions were noted only in group 1: 2 (10%). It shows that ketamine is responsible for psychosomatic reactions as proved in the study of Dr Y Y Chia et al[24]. For nausea and vomiting inj. Ondansetron was given and for psychosomatic reactions inj. Midazolam was given. Hypotension was also noted in both group 1: 2 (10%) and group 2: 4 (20%).

Incidence of phantom limb pain:

Group1: 1 patient, Group2: 1 patient and Group3: 2 patients. Incidence is comparable in all groups. So it is inconclusive in the role of pre-emptive analgesia in prevention of phantom limb pain as in the study of Dr. W.W.Zuurmondet al.

CONCLUSION

Spinal NMDA receptors (NMDA R) are important in neuropathic sensitisation and acute administration of antagonists can provide temporary attenuation of sensitisation. If establishment of the chronic pain state could be prevented by brief administration of such agents at or around the time of nerve injury (pre-emptive analgesia) it might be possible to avoid many of the unacceptable side effects associated with repeated administration of these or other antagonists.

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A Comparative Study of Pulmonary Function Tests in Obese and Non Obese Adolescents

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ABSTRACT

Background: Obesity is an emerging problem especially among adolescents due to their lifestyle changes related to low level of physical activity and high calorie diet. Excess adipose tissue is often associated with respiratory abnormalities such as reduction in lung volumes, capacities and expiratory flow rates. So there is a need to assess the pulmonary functions and to create awareness among adolescents regarding the drawbacks of obesity in adolescents as this is the high risk period for the onset of obesity which predict BMI in adulthood.

Objectives: To compare lung function parameters FVC, FEV1, FEV1/FVC, PEFR, FEF25-75% of obese adolescents with those of non obese adolescents.

Materials and Method: Study included 80 obese adolescents as cases and 80 non obese adolescents as controls in the age group of 10-19 years, which was further subdivided into 10-14 years and 15-19 years. Pulmonary function tests of each subject were recorded using a Spirothor Wavefront Hand held Spirometer. The results were compiled and statistically analyzed for significant differences.

Results: It was found that the following PFT parameters FVC, FEV1, PEFR and FEF 25-75% were significantly reduced in obese adolescents in comparison with non obese adolescents in both the age groups i.e. 10-14 years and 15-19 years.

Conclusion: Results of the study conclude that obese adolescents have a significantly lower pulmonary function in comparison with non-obese adolescents.

Keywords: *Obesity; adolescents; pulmonary function test.*

INTRODUCTION

Adolescents constitute 22.8% of the total population in India. There are approximately 230 million adolescents in India between the age group of 10-19 yrs[1]. Adolescence period is marked by a characteristic set of salient biologic, psychological and social features and many premature deaths[2].

Obesity is an emerging problem in developing countries like India, especially among adolescents due to their lifestyle changes related to low level of physical activity and high calorie diet[3,4]. In India the prevalence of obesity is between 5.6% and 24% in children and adolescents[5]. Obesity is defined as abnormal or excess fat accumulation that may impair health. BMI is used to classify overweight and obesity and is defined as a person's weight in kilograms divided by square of height in meters (kg/m^2)[6].

In children and adolescents, overweight and obesity are defined using age and sex specific normograms for BMI. Children with a BMI equal to or exceeding the age-gender-specific 95th percentile is defined obese. Those with a BMI equal to or exceeding the 85th, but are below 95th percentiles are defined overweight[7].

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Excess adipose tissue is often associated with Respiratory abnormalities such as reduction in lung volumes, capacities and expiratory flow rates, which is due to reduced chest wall expansion and lung compliance and increased respiratory resistance[8,9]. The most common Pulmonary function abnormality in patients who are obese is a reduction in ERV[10].

Health needs of adolescents are tremendous and these have seldom been met as there is no comprehensive, organized program for adolescent health in India[1] and hence there is a need to assess the Pulmonary functions and to create awareness among adolescents regarding the drawbacks of obesity in adolescents as this is the high risk period for the onset of obesity which predict BMI in adulthood.

MATERIALS AND METHOD

Source of Data

Data was collected from various schools and pre-university colleges of Bangalore between the age group of 10-19 yrs. Subjects selected based on inclusion and exclusion criteria.

Method of Collection of Data (including sampling procedure)

Data was collected using a Spirothor Wavefront Hand held Spirometer which is a portable instrument. 80 obese adolescents as subjects and 80 non-obese adolescents as controls were selected based on inclusion and exclusion criteria. The following parameters - FVC, FEV1, PEFR, FEV1/FVC, FEF25-75% were recorded after explaining and demonstrating the procedure and three recordings were done and the best of the three was considered.

Inclusion Criteria

1. Age group – 10 to 19 yrs of both genders.
2. Obese Adolescents with BMI >/= to 95th percentile for age and sex[7].
3. Non Obese Adolescents with BMI </= to 85th percentile for age and sex.

Exclusion Criteria

1. Age <10 yrs and >19 yrs.
2. Smokers and tobacco chewers
3. Subjects with acute or chronic respiratory disease.
4. History of cardiovascular and endocrine disorders.
5. Neuromuscular disorders

The obese and non obese adolescents, in the age group of 10-19 years, which will be sub grouped into 10-14yrs and 15-19yrs will be taken up for the study. Subjects will be selected according to inclusion and exclusion criteria. The procedure was explained and a written informed consent was obtained from parents/ guardian, institution heads and subjects. Following which, complete history will be taken to exclude any other medical illness.

BMI is calculated using formula Wt (kg) /ht (m^2) and percentile will be calculated by using pediatric BMI charts according to local age and sex specific[4]. Later subjects are subjected to PFT recording.

Statistical analysis

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. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Significant figures

+ Suggestive significance (P value: 0.05<P<0.10)

* Moderately significant (P value:0.01<P ≤ 0.05)

** Strongly significant (P value : P≤0.01)

RESULTS

Table 1: PFT parameters in obese and non obese adolescents in the age group 10-19 years

PFT parameters	Cases	Controls	P value
FVC	2.73±0.71	3.03±0.81	0.013*
FEV 1	2.46±0.64	2.77±0.76	0.006**
FEV 1/FVC%	90.24±6.33	91.13±5.42	0.342
FEF 25-75%	3.22±1.28	3.24±1.07	0.909
PEFR	5.11±1.53	5.78±1.69	0.009**

* Moderately significant (P value:0.01<P ≤ 0.05)

** Strongly significant (P value : P≤0.01)

Table 1 shows that the PFT parameters FVC, FEV1 and PEFR were significantly reduced in obese adolescents (10-19years) in comparison with controls. However FEV1/FVC% and FEF25-75% were not significantly different between the two groups.

Table 2: PFT parameters in cases and controls in Age group 10-14 yrs

PFT parameters	Cases	Controls	P value
FVC	2.30±0.45	2.59±0.64	0.024*
FEV 1	2.06±0.39	2.38±0.61	0.006**
FEV 1/FVC%	89.73±6.96	91.98±5.52	0.113
FEF 25-75%	2.46±0.79	3.04±0.87	0.002**
PEFR	4.18±1.03	4.82±0.97	0.005**

* Moderately significant (P value:0.01<P ≤ 0.05) ** Strongly significant (P value : P≤0.01)

Table 2 shows that the PFT parameters FVC, FEV1, FEF 25-75% and PEFR were significantly reduced in obese adolescents (10-14years) in comparison with controls. However FEV1/FVC% was not significantly different between the two groups.

Table 3: PFT parameters in cases and controls in Age group 15-19 yrs

PFT variables	Cases	Controls	P value
FVC	3.16±0.67	3.47±0.71	0.043*
FEV 1	2.86±0.59	3.15±0.70	0.048*
FEV 1/FVC%	90.75±5.67	90.28±5.26	0.699
FEF 25-75%	3.98±1.23	3.43±1.21	0.049*
PEFR	6.03±1.37	6.74±1.72	0.046*

* Moderately significant (P value:0.01<P ≤ 0.05) ** Strongly significant (P value : P≤0.01)

Table 3 shows that the PFT parameters FVC, FEV1, FEF 25-75% and PEFR were significantly reduced in obese adolescents (15-19years) in comparison with controls. However FEV1/FVC% was not significantly different between the two groups.

DISCUSSION

Obesity may be associated with a number of pulmonary abnormalities, including reduced chest wall compliance, increased work of breathing, increased minute ventilation due to increased metabolic rate, and decreased functional residual capacity and expiratory reserve volume[11].

The study is in accordance with the study done by Farida M.El-Baz et al "Impact of Obesity and Body fat Distribution on Pulmonary Function of Egyptian Children" who found statistically significant reductions in FVC, FEV1, PEF, and MVV in obese children.

The study of pulmonary functions done by Bambang Supriyatno et al in 110 obese adolescents showed pulmonary dysfunction in 58.2% obese adolescents and the most common abnormality was combined type (30%), followed by restrictive (25.5%) and obstructive type (2.7%). Mean FEV1, FVC values were below normal, while the mean FEV1/FVC ratio was normal in obese adolescents in comparison with controls.

In the study of pulmonary functions done by Swapnil J.Paralikar et al in 30 obese and 30 non obese adolescents which showed that FEV1, FEV1/FVC, MVV were significantly reduced in the obese group where as FVC and flow rates (PEFR and FEF25-75%) were not significantly different in the obese and control groups.

In the study of pulmonary functions done by A M Li et al in 64 obese adolescents and found that the FVC and FEV1 values were less, but RV and RV/TLC ratio were increased in comparison with controls.

In the study done by Joey C. Eisenmann et al "Obesity and Pulmonary function in Navajo and Hopi children", which included 256 Hopi children between 6–12 years of age and 557 Navajo children between 6–12 years of age and they found an increase in pulmonary function between normal weight and overweight children and a decrease in pulmonary function of obese children. FEV1% and FEF25–75% was significantly reduced in obese boys and FVC and FEV1 were significantly reduced in obese girls as compared to normal weight and overweight children.

The study however was in conflict with the study conducted by Perran Boran et al in children with a mean age of 7-15 years and found no significant differences in the pulmonary function test parameters; FEV1, FVC, and FEV1/FVC between obese children and controls (P>0.05).

The study was also in conflict with the study conducted by Ergun Cetinkaya et al "Effect of obesity on Pulmonary Function in Children" and found that the Respiratory function parameters; FVC, FEV1, FEF25-75% and PEFR showed no significant changes between the obese and non obese groups.

In moderate obesity, the outward recoil of the chest wall is blunted due to the weight of chest wall fat and to the space occupied by intraabdominal fat and the preserved inward recoil of the lung overbalances the reduced outward recoil of the chest wall, and FRC falls. Because respiratory muscle strength and lung recoil remain normal, TLC is typically unchanged (although TLC may fall in massive obesity) and RV is normal (but may be reduced in massive obesity)[12].

Spathopoulos et al[13] reported that the extrinsic mechanical compression due to fat accumulation which causes decreased chest wall recoil and compliance, resulting in expiratory volume reduction.

Chow et al[14] reported that childhood obesity is associated with increased airway inflammation. Obesity is a proinflammatory state, with increased leptin and proinflammatory cytokines such as interleukin-6, interleukin-1, and tumor necrosis factor-α which upregulate airway inflammation[15].

Obese people have an increased airway hyperreactivity from an obesity related decrease in airway caliber, inhibition of deep breathing, and increased latching of airway smooth muscle from a lack of tidal stretch[16] and GERD and airway wall edema from pulmonary vascular congestion also contribute to decline in lung function[17].

The above study thus concludes that Obese adolescents have a significantly lower pulmonary function in comparison with Non-Obese adolescents.

The prevention of obesity in adolescents requires a multidisciplinary, multi-phase approach, which includes dietary management, physical activity enhancement, restriction of sedentary behavior, pharmacotherapy and Bariatric surgery.

LIMITATIONS

The study was conducted in adolescent's only and there is a need to study in other groups. In this study the correlation of Pulmonary Function Test Parameters with the degree of obesity was not evaluated, which might have yielded much more information regarding the extent of decline in lung function in relation to the severity of obesity. We were not able to evaluate the lung function parameters FRC and ERV as these parameters could not be measured by hand held spirometer; which can be measured by a higher version of spirometer as there are studies conducted which have shown that the FRC and ERV as the most commonly reduced parameters in obese individuals.

Conflict of Interest: None

Source of Funding: Personal funds.

Ethical Clearance: Permission was taken from institutional research and ethical committee.

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Autonomic Dysregulation in Females with Chronic Somatic Pain

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ABSTRACT

Background: It is documented that patients suffering with chronic somatic pain have altered symapathovagal activity which reflects the autonomic imbalance. Ladies suffer more with chronic pain especially backache. Since most of the work on it is done outside the country, we tried to see the autonomic changes in Indian female patients suffering with chronic somatic pain.

Method: Thirty three female patients suffering from chronic somatic pain (duration 6months or more) were included to see its effect on autonomic nervous system. These patients were compared with age and sex matched twenty two controls. A battery of non invasive autonomic function tests was done to observe the status of sympathetic and parasympathetic activity in both groups.

Result: The study revealed increased sympathetic and decrease parasympathetic activity in patients with chronic pain. In females of younger age group, the autonomic changes were less as compared with elderly ladies.

Conclusion: It appears that there is possibility of altered symapathovagal response in females with chronic pain, the mechanism of which is still unclear. It seems as there may be some protection in young females by female sex hormones. It may also be due to psychological changes involving the limbic system due to persistent pain.

Keywords: *Autonomic nervous system, Chronic somatic pain, Autonomic function tests.*

INTRODUCTION

Pain is a protective mechanism, which apprises a person from damaging influence of the stimulus on body tissues[1,2] . The definition of chronic pain is not very clear with variant views[3,4,5] though it is widely accepted as the pain with greater than six month duration. As per International Association for study of Pain (IASP), chronic pain is associated with depression, anxiety or sleep disturbances either due to disease itself of due to medication[6,7]. It is observed that the autonomic imbalance does exist in chronic pain sufferers [8,9,10,11] but there is difference of opinion about its cause and variations[12]. These changes are reversible in early stage but becomes permanent with increase in duration. The incidence of chronic somatic pain are more prevalent in females especially after menopause. But the autonomic changes are not fully explored in them. Therefore the present work was undertaken.

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MATERIAL AND METHOD

This case control study was conducted in the autonomic function lab of Department of Physiology at L.L.R.M Medical College, Meerut over a period of 15 months following approval from Institutional Ethical Committee. The study involved 33 female patients between 18-65 years age suffering from chronic pain attending Orthopaedic OPD and pain clinic of SVBP Hospital, to assess their Autonomic functions. Twenty two age and sex matched ladies not suffering from any painful disorder were also taken for AFT assessment

who served as control group. All subjects of both groups were thoroughly explained about the nature and purpose of the study. Written informed consent was obtained from all subjects prior to obtaining any data from experiments. Each subject was interviewed regarding their medical history, including family history, medications, current health condition, menstrual cycle, and lifestyle followed by detailed medical examination. Exclusion criteria were ladies suffering with diabetes, hypertension,chronic kidney disease or any factor/ history of drug affecting autonomic activity. After taking the anthropometric parameters, a battery of non invasive autonomic function tests were done to test the sympathetic and parasympathetic activity in chronic somatic pain patients as well as control subjects. All test was performed under thermoneutral condition. The subjects were asked to remain abstain from coffee, tea or cola for 6 hr before tests. Each subject was given 15 min relaxation before the start of autonomic function tests.

Sympathetic function Tests:

1. Orthostatic Hypotension Test (OHT): The BP of the subject was recorded in supine position. Then subject was made to stand within 3-4 sec. and to remain motionless. Blood pressure was recorded in 30 second interval. Difference between readings of systolic BP in lying position and then after standing were calculated. Normal response was taken as <10mmHg fall in blood pressure. A fall in SBP > 20-30 mm 0f Hg was taken as abnormal[13].

2. Hand Grip Test (HGT): The subject is asked to grip the handgrip dynamometer using maximum force with the dominant hand for 1minute.The value is noted down and the procedure is repeated thrice. The maximum value of the three readings is considered as their maximal voluntary contraction (MVC). A mark is made on the dynamometer at a point of 30% of maximum voluntary contraction. The subject was instructed to maintain a sustained grip on dynamometer up to mark for 2 minutes. Further he was also told to indicate if unable to maintain the grip for 2 minutes. Highest increase in diastolic blood pressure on performing isometric exercise is taken as test response. Increase in Diastolic blood pressure ≥16mmof Hg was considered as normal and≤ 10 mm of Hg abnormal.

Parasympathetic Function Tests:

1. Heart rate during deep breathing (Expiration/ inspiration ratio): Subject was asked to take deep breathing at rate of 6 breath/min. A standard lead II ECG was recorded during deep inspiration and expiration continuously.Variation in heart ate was calculated as ratio of longest RR interval during expiration to shortest RR interval during inspiration[14].

A value of 1.20 or more is taken as normal.

2. Standing to lying ratio (SLR): The test was performed after 10 min of supine rest. Then the subject was asked to stand comfortably for some time. She was then asked to lye supine on the couch immediately while ECG was recorded continuously for 1 minute.The ECG was recorded for 30 seconds to get the baseline value and then during standing position for 1 minute.The 30: 15 ratios was calculated by taking ratio of longest R-R interval at beat 30 and shortest R-R interval at beat 15 after standing. The value of 1.00 for 30:15 ratios was taken as normal and value of <1.00 was considered as abnormal [15] .

3. Valsalva Ratio: After demonstrating the procedure to the subject and practicing by him to be confident, he was made to perform valsalva manoeuvre in sitting posture for 15 seconds by blowing against closed glottis through a mouth piece attached to manometer and maintained an expiratory pressure of 40mm of Hg for 15 seconds. A small air leak in the system is useful to prevent the closure of glottis during the manoeuvre. At the end of 15 seconds the pressure is released. Care was taken to prevent deep breathing before and after the manoeuvre.ECG was recorded for 15 seconds before the manoeuvre to get the baseline value, and then during the manoeuvre (Strain period, 15 sec) and for fifteen seconds after release of pressure.The valsalva ratio was calculated as the ratio of longest R-R interval after manoeuvre to shortest R-R interval during manoeuvre. Value >1.21 was taken as normal and value <1.21 was considered as abnormal.

The results were expressed as mean and sd and the data were analyzed by unpaired student ‘t’ test

RESULTS

The biophysical parameters of female subjects in control as well as pain group patients (cases) are comparable (Table I).

Tables II shows the changes in autonomic functions in younger ladies. It is observed that in younger ladies

with pain the HGT showed a greater response than their control counterparts. But, for OHT, there was greater fall in SBP in cases than control group. The changes in both tests were insignificant as compared with controls. The parasympathetic function tests showed a significant decrease in all parameters in pain group patients.

Table III showed the autonomic activity in elderly females. It was observed that the HGT response exhibited a greater but insignificant rise in DBP than the control group similar to younger females. There was significant increase in blood pressure response in OHT in pain group patients. All the parasympathetic tests showed a significant decrease in ladies with pain (cases) as compared with control group. However, the level of significance of all parasympathetic functions tests was greater in elderly than younger females with pain.

DISCUSSION

Pain is a useful symptom apprising the person of tissue damage and also is of prognostic value in determining the rate of healing. Chronic pain, more prevalent in females, is more cumbersome and also have physical, mental and behavioural agony for the subjects. It is observed that chronic pain also causes alteration in autonomic activity which is probably responsible for the various changes observed in chronic pain sufferers.

All ladies suffering with chronic pain exhibited an insignificant increase in sympathetic activity as is evident from HGT but the blood pressure response in OHT did not support it and no cause can be ascertained to it. However, since change in the blood pressure response is within normal limit, it can not be taken as foolproof measure. Heart rate variability can be a better method to judge the sympathetic reactivity in such cases. In elderly ladies with pain, the similar response was observed but the changes were of greater magnitude in them than the younger females with pain. It might be possible that in younger age, the ladies do have greater tolerance or the female hormones might be giving some protection which is lost with age. A common observation in all subjects was that symaptho vagal balance is shifting towards sympathetic side. But the parasympathetic activity is also found to be low which may further shift the balance towards the sympathetic overactivity. Many researchers have found the increased basal sympathetic activity in persons with chronic regional pain[11] . It was found that in patients of chronic neck shoulder pain (NSP), there is decrease parasympathetic activity which persists even on rest as well as sleep[16] . The sympathetic activity is altered to laboratory stressors.

TABLE 1: Anthropometric data of control and cases

Parameters	Control ((n=22) Females (mean ± SD)	Cases (n=33) Females (mean ± SD)
Age (yr)	41.55±9.88	44.21±10.34
Height (m)	1.5±0.07	1.49±0.09
Weight (kg)	53±5.46	53.94±5.39
BMI(kg/m^2)	35.11±3.53	36.35±3.71

TABLE 2 : Autonomic Functions In Younger Females (25-35 Yr)

	Control (n=9) females (mean ± SD)	Cases (n=10) females (mean ± SD)	p value
Sympathetic Test			
OHT	7.63±3.46	14.90±10.15	0.72
HGT	19.80±4.98	22.67±9.11	0.41
Parasympathetic test			
DBT	1.52±0.38	1.25±0.15	0.05*
SL Ratio	1.21±0.23	0.99±1.13	0.02*
Valsalva	1.74±0.41	1.28±0.35	0.01*

*p-value ≤ 0.05

TABLE 3. Autonomic Function in Elderly Female of Age >45 Years

	Control (n=13) females (mean ± SD)	Cases (n=23) females (mean ± SD)	p value
Sympathetic Test			
OHT	6.46±1.33	10.26±6.63	0.05*
HGT	20.38±7.60	18.17±3.59	0.24
Parasympathetic test			
DBT	1.43±0.27	1.08±0.09	0.0001**
SL Ratio	1.16±0.11	0.98±0.26	0.03*
Valsalva	1.66±0.39	1.23±0.22	0.0002**

***p-value ≤ 0.05; ** p- value ≤ 0.0001**

CONCLUSION

It appears that there is possibility of altered sympathovagal response in females with chronic pain, the mechanism of which is still unclear. It may also be due to psychological changes involving the limbic system due to persistent pain.

Source of Funding- Self

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A Comparative Study of Serum Total Antioxidant Capacity (TAC) in Male Smokers and Non Smokers

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ABSTRACT

Back ground: Smoking is characterized by increased free radicals and stress oxidative.

Objective: To compare total antioxidant capacity between adult male smokers and non smokers .

Method : A total of 110 male subjects were involved in this study. 56 of them were non smokers and another 54 of them were smokers. Age of the smokers and non smokers were ranged between 30 to 45 years. Venous blood was collected from subjects after an overnight fast in the morning . Blood samples were used for evaluation serum total antioxidant capacity. TAC was measured by using the total ferric reducing assay .

Results : Data showed that total antioxidant capacity was significantly higher in smoker than non-smoker subject ($p < 0.05$). Based on the Pearson correlation coefficient ,there was no a significant correlation between the number of smoked cigarettes and the TAC ($r = - 0.127$, $p = 0.723$)

Conclusion: This study concluded that smoking is associated with decreased antioxidant capacity and stress oxidative.

Keywords: *Free radicals, Antioxidant capacity, Smoking.*

INTRODUCTION

Free radicals, atoms or molecules with one or more unpaired electrons, are highly reactive and mainly responsible for causing damage to molecules, such as proteins, carbohydrates, lipids and DNA [1,2].

Various exogenous factors, such as radiation, smoking, etc., cause the production of free radicals, inducing an imbalance between free radicals and antioxidant protection mechanisms, which is called oxidative stress, and enhancing LDL oxidation[3]. Smoking accounts for 17%-30% of all morbidity from cardiovascular diseases and is considered to be a preventable cause[4]. Cigarette smoke is rich in Reactive Oxygen and Nitrogen Species (ROS and RNS), such as nitrogen, alkoxyl and peroxyl radicals. These can cause the production of other free radicals, which, in turn, initiate lipid peroxidation on the LDL particle and cause endothelial cell dysfunction[5,6].

In the view of the fact that many people are hooked to smoking, regardless of age and gender, this study was undertaken to measure and compare the level of Total Antioxidant capacity (TAC) of smokers and non smokers.

METHOD

A total of 110 male subjects were involved in this study. 56 of them were non smokers and another 54 of them were smokers. Age of the smokers and non smokers were ranged between 30 to 45 (majority of them 30-40 years old). All participants were non-athletes and non-alcoholics. All subjects including non-smokers had not participated in regular exercise/ diet programs for the preceding 6 months. Inclusion criteria to study for smoker group were smoking history of At least 10 cigarettes a day for 5 years for smoker group . Those with type II diabetes, respiratory and

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cardiovascular diseases, cancer, kidney dysfunction and other chronic diseases were excluded.

All of them signed the consent form. A diet survey form was provided to them. Blood was collected at Nimra Institute of Medical Sciences, Vijayawada during June – December 2015. The blood was kept overnight before centrifugation to get serum. Centrifugation was done at 1250 rpm for 5 minutes at room temperature. Serum samples were stored at -70 ° c until required for use. TAC was measured by using the total ferric reducing ability assay which was established by Benzie and Strain (1999) [7]. In ferric reducing assay, ferric to ferrous ion reduction at low pH causes a colored ferrous –tripyridyltriazone complex to form. TAC is obtained by comparing the absorbance change at 593nm in test reaction mixtures with those containing ferrous iron in known concentration.

All the data collected was analyzed using the t-test in SPSS version 15 for differences in TAC of two mean values between non smokers and smokers. Pearson correlation coefficient was used for analysis of correlation between the number of smoked cigarettes and TAC. P values < 0.05 were considered as statistically significant.

RESULTS

Total of 66 smokers and 44 non smokers were evaluated for TAC. Demographic details of Smokers and non smokers are listed in table 1 . All participants of two groups matched for age and anthropometrical markers.

In this study, trend of lower serum TAC in smokers compared with that of non smokers was established and this difference in TAC between both groups was statistically significant. This result suggested the presence of oxidant/antioxidant imbalance systemically in smokers (table 2).

Based on the Pearson correlation coefficient ,there was no a significant correlation between the number of smoked cigarettes and the TAC, where the correlation coefficient was r = - 0.127 with a significance level of p = 0.723 and a confidence level of 95% (P > 0.05).

DISCUSSION

According to the findings of this study, male smokers had lower levels of total antioxidant capacity. These findings relatively support the devastating effects of cigarette smoking on antioxidant defense system, as well as the progress of oxidative stress in the presence of cigarette smoking.

Hence it can be clearly concluded that reduced antioxidant capacity in cigarette smokers is associated with increased production of oxidants and free radicals. In the study conducted by Ranjbar *et al.,* (2004) lipid peroxidation levels in smokers were more than in nonsmokers. In their study, total antioxidant capacity of plasma and plasma thiols was lower in smokers compared with smokers. The reduced thiols and total antioxidant capacity of plasma suggest that smokers, had an increased production of free radicals[8], which corresponds with the results of the present study. Block, in a study, demonstrated that the amount of lipid peroxidation and -F2 isoprostanes were increased significantly in smokers compared with nonsmokers (Block *et al.,* 2002) [9].

Increase or improvement of antioxidant capacity is facilitated through regular exercise, good nutrition, and more importantly the use of antioxidant supplements, which under different conditions, such as exercising, each antioxidant system shows different immediate or chronic response based on biochemical and biomolecular regulatory mechanisms. These systems are weakened under some conditions. In other words, some internal or external stimuli contribute to decreased antioxidant capacity and consequently to increased production of oxidants or free radicals, based on the stimulation degree. For example, the devastating impacts of smoking, especially cigarette as the most common tobacco product, on the antioxidant system have been frequently discussed [10].

Clinical studies have indicated that per puff of cigarette contains more than 1014 free radicals and is a complex mixture of 4700 chemical compounds [10].

These results lead us to the conclusion that cigarette smoking may have many adverse results in smokers with regard to oxidative stress and antioxidant protection markers.

In conclusion, chronic exposure to cigarette smoke affects the oxidative stress biomarkers negatively. This means there is decreased antioxidant protection and increased risk for cardiovascular diseases in smokers. However , larger studies are needed to confirm the

results and indications of the present study. A major effort should be made for the elimination of the bad habit of cigarette smoking, eradicating the adverse effects for smokers, as well as for healthy people in their vicinity.

Table 1 Demographic profile of smokers and non smokers

Physiological Variables	Smoking Volunteers	Non-Smoking Volunteers	P value
Mean age (years)±SD	35.7± 5.8	34.0± 4.4	NS
Mean BMI (kg/m^2)	22.4± 4.1	23.1± 3.7	> 0.05
Heart Rate (beats/ min)	84.6± 9.3	76.4± 5.8	> 0.05
Blood Pressure (mmHg) 128.8± 10.8 121.1± 13.8 > 0.05 77.1± 8.6 72.7± 10.4 < 0.05			

* NS : Not significant. SBP= Systolic blood pressure, DBP= Diastolic blood pressure.

Table 2 Showing TAC value of smokers and non smokers

	Mean TAC (mmol/l) ± SE	P value
Smokers	0.309±0.014	< 0.05
Non Smokers	0.561±0.034	

Conflict of Interest: All authors confirm that there is no conflict of interest.

Ethical Clearance : Institutional ethical committee

Source of Funding: Nil

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A Study on Comparison of Bleeding Time and Clotting Time in Different Blood Groups

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ABSTRACT

Background: Blood group plays a vital role in the field of medicine. There is a clear association between ABO blood group status and von Willebrand factor. Deficiency of vWF leads to Haemorrhagic disorders, while elevated levels are a risk factor for thrombosis.

Aims & Objectives: To assess the relationship between Bleeding time and clotting time among various Blood groups and also to identify any gender difference among the same.

Materials and Method: This is a cross sectional study including 100 Undergraduate students of age group 17 to 20 years. Bleeding time (by Duke's filter paper method) and Clotting time (by Wright's capillary tube method) was determined after obtaining an informed consent from the students. Statistical analysis was done.

Results: In our study, bleeding time was prolonged among B group and clotting time was prolonged among O group, also prolonged bleeding time and clotting time among the females compared to the males.

Conclusion: A larger study group has to be involved for further study and also the plasma von Willebrand factor levels should be estimated to rule out any possible reason for the different levels of clotting and bleeding time among the ABO groups. This will help us to identify the risk group and take necessary precautions as early as possible.

Keywords: *Blood groups, Bleeding time, Clotting time.*

INTRODUCTION

In the year 1900 scientist Karl Landsteiner identified the ABO system of blood group which was the starting of Blood banking and Transfusion medicine. The ABO system consists of complex carbohydrate molecules. The A and B Glycosyltransferase encoded by A and B alleles converts H antigen into A and B determinants. This transferase enzyme is deficient in the group O individuals who continue to express H antigen.[1]

Blood group antigens are inherited as Mendelian determinants. The individuals are divided into four major blood types on this basis. Type A individuals have the antigen A, type

B have antigen B, Type AB have both and Type O have neither of these antigens. These A and B antigens are complex oligosaccharides that differ in their terminal sugar.[2] The ABO blood group antigens appear to have been important throughout our evolution because the frequencies of different blood types vary among different populations.[3] Bleeding time is the time interval between the skin puncture and spontaneous unassisted stoppage of bleeding. Clotting time is the time interval between the puncture of blood vessels and formation of fibrin threads.[4] A clear correlation has been established between the ABO phenotype and the level of two proteins in blood clotting ie factor VIII and vonWillebrand factor (vWF). Individuals with blood group O have about 25% less factor VIII and vWF in their plasma, thus increasing their clotting time and may cause excessive bleeding.[5]

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The relationship between bleeding time, clotting time and blood groups is important in certain clinical conditions like epistaxis, cardiac surgery or thrombosis etc. Studies have reported that half of the epistaxis patients had blood group O and blood group O was associated with a lower expression of vWF (von Willebrand factor) as compared with non O groups . A longer bleeding time was demonstrated in patients with goup O compared with non O groups.[6,7] An association between non O blood groups and thromboembolic disease including ischaemic heart disease and peripheral vascular disease has been recognised by several studies. A study indicated that non O blood group was associated with two fold increased cardiovascular mortality compared to blood group O.[8,9]

AIMS AND OBJECTIVES

This study was done to find out if any relationship existed between ABO blood groups and Bleeding time (BT) and Clotting time(CT).

MATERIALS AND METHOD

This study was done among the first year UG students in the department of Physiology of Shimoga Institute of Medical Sciences, Shivamogga. 100 undergraduate students within the age group of 17 to 20years were included in this study. The exclusion criteria for selection of the students were any history of bleeding disorders and H/o drug intake (NSAIDS). Institutional ethical committee clearance was obtained.

PROCEDURE

Blood group determination was done by adding antisera A and B with the blood sample and confirmation was done by the appearance of clumping among RBCs. If the blood sample forms clumps with antisera A, it is blood group A; with antisera B, blood group B; AB forms clumps with both, and O with none. Estimation of clotting time was done by Wright's Capillary tube method and bleeding time by Duke's filter paper method.[10] (normal bleeding time: 1-5min, normal clotting time : 2-8min)

RESULTS

The data of 100 students were collected and analyzed statistically. The study group's age was homogenous (17 to 19 years) as everyone belonged to First year MBBS. Out of 100 students there were 38 females and 62 males.

'O' blood group was found to be more common and 'AB' blood group was less common in our study as shown in table 1.

Bleeding time was found to be more(>4min) in 'B' group(46.4%) when compared to 'AB' group(40%), 'O' group(25.6%) and 'A' group(17.9%) as shown in table 2.

Clotting time was found to be more (>6min) in 'O' group (38.5%) when compared to 'AB' group(20%) and 'A' and 'B' group(10.7%) as shown in table 3.

Bleeding time was found to be prolonged (>4min) in females (44.7%) than males (20.9%) as shown in table 4.

Clotting time was found to be prolonged (>6min) in females (26.3%) than males (17.7%) as shown in table 5.

Table – 1: Distribution of blood groups in males and females

BLOOD GROUP	MALES	FEMALES	TOTAL
A	21	7	28
B	14	14	28
O	24	15	39
AB	3	2	5
TOTAL	**62**	**38**	**100**

Table – 2: Distribution of Bleeding time in various blood groups.

BLOOD GROUP	< 4 mins (%)	> 4 mins (%)
O (39)	29 (74.3 %)	10 (25.6 %)
A (28)	23(82.1 %)	5 (17.9 %)
B(28)	15 (53.4 %)	13 (46.4 %)
AB(5)	3(60 %)	2 (40 %)

Table – 3: Distribution of clotting time in various blood groups.

BLOOD GROUP	< 6 mins (%)	> 6 mins (%)
O (39)	24 (61.5 %)	15 (38.5 %)
A (28)	25 (89.3 %)	3 (10.7 %)
B(28)	25 (89.3 %)	3 (10.7 %)
AB(5)	4 (80 %)	1 (20 %)

Table – 4: Gender wise distribution of Bleeding time.

GENDER	< 4 mins (%)	> 4 mins (%)
FEMALE(38)	21(55.3%)	17(44.7%)
MALE(62)	49(79%)	13(20.9%)

Table – 5: Genderwise distribution of Clotting time.

GENDER	< 6 mins (%)	> 6 mins (%)
FEMALE(38)	28(73.7%)	10(26.3%)
MALE(62)	51(82.2%)	11(17.7%)

DISCUSSION

In this study BT was raised significantly in blood group B. Similar results were seen in another study[11] which shows that bleeding time was increased in blood group B and clotting time was raised in AB blood group, however in our study, CT was found to be raised in O blood group. vWF is 25% more in non O group individuals compared to group O individuals. This means that the clotting time and the bleeding time will be elevated among the O group individuals compared to the other groups[12] and this supports our study with results of increased clotting time in O blood group individuals.

In our study, female individuals had prolonged clotting time (> 6 minutes) compared to males and prolonged bleeding time (> 4 minutes) compared to males. This finding goes along with the study done by Roy B et al,[13] which suggested prolonged clotting time and bleeding time among females compared to males. As per Ercan M et al,[14] the female individuals having comparatively increased bleeding time and clotting time can be due to the presence of estrogens, that decreases the level of fibrinogen in the plasma and increase the clotting time.

CONCLUSION

A larger study group has to be involved for further study and also the plasma von Willebrand factor levels should be estimated to rule out any possible reason for the different levels of clotting and bleeding time among the ABO groups. This will help us to identify the risk group and take necessary precautions as early as possible.

Source of Funding: Self

Conflict of Interest: Nil

Ethical Committee Clearance: Taken

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A Comparative Study of Sensory Thresholds in Type 2 Diabetic and Non-Diabetic Individuals with Eulipidemia and Dyslipidemia

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ABSTRACT

Background: Insulin resistance and dyslipidemia are intertwined processes that are intimately associated with Type 2 Diabetes Mellitus (T2DM). Hyperlipidemia is an established risk factor for earlier development of cardiovascular and neurological complications in T2DM. There are controversial evidences for association of hyperlipidemia and sensory neuropathy in non-diabetic (NDM) individuals. So, this study was taken up to compare the sensory thresholds in type 2 diabetic and non-diabetic individuals with eulipidemia and dyslipidemia.

Methodology: Fasting blood sugar and lipid profile of 50 diabetic and 50 non- diabetic individuals were estimated. Using lipid profile, subjects in each group were further subgrouped into eulipidemics and dyslipidemics. The sensory threshold (in Volts) for vibration sense was evaluated using Biothesiometer.

Results: Among the 50 diabetics, 16 were eulipidemics and 34 were dyslipidemics. Among the 50 non diabetics, 32 were eulipidemics and 18 were dyslipidemics. The sensory thresholds were significantly higher among diabetics than non diabetics (19.1±5 vs 15.6±4.6). The sensory thresholds were significantly higher in dyslipidemic diabetics than eulipidemic diabetics (20.7±4.8 vs 15.6±3). Also, thresholds were significantly higher in dyslipidemic non diabetics than eulipidemic non diabetics (18.1±4.9 vs 14.2±4).

Conclusion: Dyslipidemia is strongly associated with the development of sensory neuropathy in non - diabetics and dyslipidemia augments the progression of sensory neuropathy in Type 2 Diabetes Mellitus.

Keywords: *T2DM, Dyslipidemia, Sensory threshold, Sensory neuropathy.*

INTRODUCTION

Diabetes Mellitus (DM) is an epidemic disorder in the present modernised society. The global burden of Type 2 Diabetes Mellitus (T2DM) in 2014 was 422 million with a prevalence of 8.5% among adults above 18 years of age[1]. In the year 2015, 69.2 million (8.7%) of indian population were diabetics[2].

Peripheral neuropathy is the most common complication of T2DM[3]. The association between dyslipidemia and micro vascular complications including peripheral neuropathy in Type 2 diabetes mellitus is well established[4]. Insulin resistance and dyslipidemia are intertwined processes that are intimately associated with T2DM[5].

There is paucity in the literature comparing the effect of dyslipidemia in diabetic and non diabetic (NDM) individuals with respect to peripheral neuropathy. Hence the present study was undertaken to compare the sensory thresholds in Type 2 diabetic and Non-diabetic individuals with Eulipidemia and Dyslipidemia.

MATERIALS AND METHOD

Ethical clearance was obtained from the Institutional Review Committee of Bangalore Medical College and Research Institute. The study was conducted in the Department of Physiology & Department of Biochemistry, BMCRI, Bangalore.

Anthropometry

A Written and informed consent was obtained from all subjects. A detailed history was elicited. Anthropometric measurements such as height and weight were measured with which Body Mass Index (BMI)/Quetelet Index was calculated. General physical examination and systemic examination were done for all subjects.

Biochemical Assays

All subjects followed the standardized protocol for laboratory investigations and fasting blood samples were collected and tested for the parameters such as fasting blood glucose (FBG), serum triglycerides (TG), total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) and LDL/HDL ratio.

Sub grouping

NCEP ATP-III (National Cholesterol Education Program Adult Treatment Panel III) guidelines were used for subgrouping the individuals into eulipidemics and dyslipidemics with their lipid profile data[6].

Sensory threshold testing

Sensory threshold testing for appreciation of vibration perception (VPT- Vibration Perception Threshold) was done using biothesiometer (Vibroscreen-Diabetik India.pvt. ltd). The biothesiometer probe tip was applied against six different bony prominences in the foot namely the hallux (great toe), first, third, fifth metatarsals, heel and medial plantar arch. The recording of threshold at the hallux were taken for statistical analysis, as it is the most appropriate site for sensory threshold testing in the foot[7]. Vibrations were delivered at four different intensities starting from 10 Volts, 15V, 20V until 25V. The lowest intensity at which vibration sensation was perceived was recorded as the sensory threshold of the individual.

Statistical Analysis

Descriptive and analytical statistics were used in this study. 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. SPSS Software version 23.0 was used for statistical analysis. P-value less than 0.05 was taken as a stastically significant result. Microsoft excel was used to generate tables and graphs.

FINDINGS

The baseline characteristics of subjects are listed in Table 1. FBG, TG, TC and VLDL were significantly higher in diabetic individuals as compared to non-diabetic individuals. Whereas, Age, BMI, LDL, HDL and LDL/HDL ratio were not significantly different among the groups. Based on the NCEP-ATP III guidelines[6] each of diabetic and non diabetic group were further divided in to Eulipidemics and dyslipidemics after sensory threshold testing. Among the 50 diabetics, 16 were eulipidemics and 34 were dyslipidemics. Among the 50 non diabetics, 32 were eulipidemics and 18 were dyslipidemics.

The sensory thresholds were significantly higher among diabetics than non diabetics (19.1±5 vs 15.6±4.6) (Table 2; Fig.1).

Among the diabetics, the sensory thresholds were higher in dyslipidemics compared to eulipidemics (20.7±4.8 vs 15.6±3) (Table 2; Fig.1).

Among the non diabetics, the sensory thresholds were higher in dyslipidemics compared to eulipidemics (18.1±4.9 vs 14.2±4) (Table 2; Fig.1).

In addition to these, we also observed that sensory thresholds were higher in non diabetic dyslipidemic subjects compared to diabetic eulipidemic subjects (18.1±4.9 vs 15.6 ± 3.1) (Table 2; Fig.1).

Table 1: Baseline characteristics.

Parameter	NDM	T2DM	P-value
Sample size	50	50	
Age (years)	43±9	45±7	0.065
BMI (kg/m^2)	26.3±4	26.9±3	0.39
FBG (mg/dL)	83.7±6.9	167.9±39	0.0001*
TG (mg/dL)	154.5±76	210±89	0.001*
TC (mg/dL)	177.5±43	201.9±50	0.01*
LDL (mg/dL)	107±32	120±38	0.07
HDL (mg/dL)	40.3±9	40±8	0.8
VLDL (mg/dL)	30.6±16	42±18	0.001*
LDL/HDL	2.7±0.9	3±0.9	0.09

* P value < 0.05 – Statistically significant

Table 2: Comparison of sensory thresholds among the groups and subgroups.

Groups and Subgroups	Sensory Threshold (Volts) Mean ± SD	P value
Non diabetics (n= 50)	15.6 ± 4.6	0.001 *
Diabetics (n=50)	19.0 ± 5.0	
Non Diabetic Eulipdemics (n=32)	14.2 ± 4.1	0.001 *
Non Diabetic Dyslipdemic (n=18)	18.1 ± 4.9	
Diabetic Eulipdemics (n=16)	15.6 ± 3.1	0.001 *
Diabetic Dyslipdemics (n=34)	20.7 ± 4.8	

* P value < 0.05 – Statistically significant

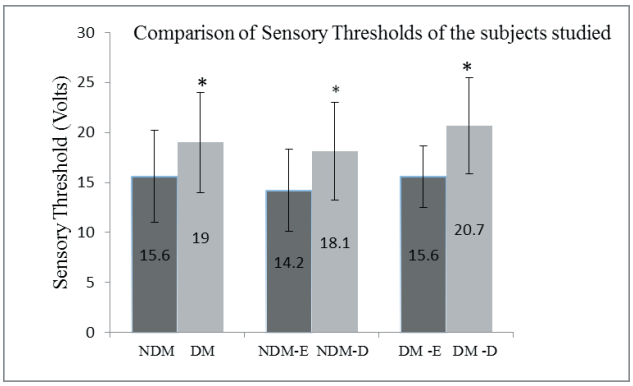

Figure 1: Comparison of sensory thresholds among the groups and subgroups.

* P value < 0.05 – Statistically significant

NDM –Non diabetics; DM – Diabetics; E –Eulipidemics; D - Dyslipidemics

DISCUSSION

The present study reveals that the sensory threshold was higher in diabetic subjects compared to non diabetic subjects. The sensory threshold was higher in dyslipidemics compared to eulipidemics among both diabetics and non diabetics.

Teunissen et al.[8] concluded that hypercholesterolemia was one of the factor contributing to axonal neuropathy with idiopathic cause. The present study showed an association of dyslipidemia with sensory neuropathy by demonstrating sensory threshold elevation in dyslipidemic non diabetic subjects.

Besides, sensory threshold was higher in non diabetic dyslipidemic subjects compared to diabetic eulipidemic subjects. Hence, elevated lipids alone have a contributory effect to peripheral neuropathy, the underlying mechanism of which is explained below. In 2008, Smith et al.[9] concluded that normoglycemic neuropathy patients had significantly higher total and LDL cholesterol compared to diabetic subjects without neuropathy and lipid abnormalities are particularly prevalent among neuropathy subjects.

Another observation was that dyslipidemia may be an individual risk factor causing peripheral neuropathy in non diabetic individuals. Elliott et al.[10] observed that dyslipidemia is one of the factors predicting the development of large fiber dysfunction in diabetic peripheral neuropathy which was supported by vibration perception threshold tests.

Toth et al.[4] observed the independent associations of lipid fractions and microvascular complications in diabetes whereas in the present study where the association between lipid abnormalities and neuropathy in non diabetic subjects were also observed.

Various studies have found that dyslipidemia is a risk factor in the progression of diabetic neuropathy[10-13]. There is a lack of literature about comparison of sensory thresholds between diabetic and non diabetic individuals with lipid abnormalities and effect of dyslipidemia in non diabetic individuals.

Dyslipidemia elevates plasma oxidized low-density lipoprotein (oxLDL) levels, which are recognized by oxLDL receptors on the membranes of neurons, and activate cellular NADPH oxidase. NADPH oxidase generates Reactive Oxygen Species (ROS) in neurons, which elicits cellular oxidative stress[14].

In non diabetic dyslipidemic subjects ROS causes inhibition of Endothelial Nitric Oxide synthase (eNOS) and hence inflammatory changes in the endothelium.

This is followed by endoneural arteriolar thickening and hyalination and thickening of basement membrane of Vasa nervorum, eventually leading to development of microangiopathy. Sensory neuropathy ensues by segmental demyelination of nerves and loss of nerve fibres[14].

In diabetics with dyslipidemia apart from the above mentioned mechanism, advanced glycosylation products (due to hyperglycemia) also play a key role in the development of sensory neuropathy[14]. Hyperglycemia alone can initiate the process of oxidative stress producing ROS that eventually lead to the degeneration and death of neurons[15].

Also to note the sensory threshold is higher in non diabetic dyslipidemic subjects than diabetic eulipidemic subjects, showing that dyslipidemia is both an individual risk factor in non diabetics and contributory risk factor in the progression of diabetics for development of sensory neuropathy. Hence, focus on screening and treatment for dyslipidemia in both diabetics and non diabetics has to be emphasised to prevent microvascular complications such as neuropathy.

Vibration sensation being one of the sensations affected early in large fibre neuropathy, can be used to detect neuropathy at earlier stages. Biothesiometer is better than both tunning fork tests and monofilament test for detection of neuropathy using VPT[16]. Also, biothesiometer being a simple equipment can be used for quick screening and early detection of sensory neuropathy.

There were limitations in the present study as the results were not adjusted for confounding factors such as duration of diabetes and glycemic control. Also, biothesiometer being a screening equipment cannot be used as a diagnostic tool. This validates further research with the help of better diagnostic methods such as nerve conduction studies.

CONCLUSION

Dyslipidemia is strongly associated with the development of sensory neuropathy in non diabetics and dyslipidemia augments the progression of sensory neuropathy in Type 2 Diabetes Mellitus. Biothesiometer can be used for screening and early detection of neuropathy, while focusing on the management of dyslipidemia in diabetics as well as non diabetics to prevent worsening of microvascular complications.

Conflict of Interest: There is no conflict of interest from the authors.

Source of Funding: Self

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Smoking Effects Over Haematological Parameters in Healthy Population: Cross Sectional Study

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ABSTRACT

Introduction: Smoking is said to be one of the most important cause of mortality. The active substances in cigarettes are administered by burning the leaves and inhaling the vaporized gas. The effects of smoking on human health are serious. With this view present work was planned to study effects of smoking over various haematological parameters in young healthy adults. **Material & method:** The present study work was conducted in physiology department. We included 70 healthy male subjects between the age group of 20-35 years from MNRMC and Hospital, Sangareddy, out of which 35 were smokers and 35 were non-smokers. Subjects were from staff members, residents and patients from routine OPD. Prior informed written consent was obtained after explaining the procedure and purpose of study tests. The Total Leucocyte Count (TLC) and the Differential Leucocyte Count (DLC) was done by coulter machine automated record . **Results:** This study showed a significant increase in the TLC from a mean value of 7442/cu.mm in non-smokers to about 8640/cu.mm in smokers ($P< 0.01$ & $Z >2$) and an increase in the lymphocyte count in smokers ($P< 0.01$ & $Z >2$) as compared to non-smokers. **Conclusion:** From present study it may be concluded that smoking has a direct effect over haematological parameters.

Keywords: *Total Leucocyte Count (TLC), Differential Leucocyte Count (DLC), Electronic Cell Counter, Smoking.*

INTRODUCTION

Smoking is said to be one of the most important cause of mortality.[1] The active substances in cigarettes, are administered by burning the leaves and inhaling the vaporized gas. This quickly and effectively delivers substances into the bloodstream by absorption through the alveoli in the lungs. The effects of smoking on human health are serious. The ingredients in cigarettes affect everything from the internal functioning of organs to the efficiency of the body's immune system.[2] Toxic ingredients in cigarette smoke travel throughout the body, causing damage in several different ways.Alterations in the haematological parameters may be responsible for the high risk of occlusive vascular disease in chronic smokers.[2,3] Chronic smoking seems to cause an upward shift of haemoglobin dissociation curve, which may decrease the utility of haemoglobin levels in the detection of anaemia in smokers, suggesting that haemoglobin cut-off values should be adjusted for smokers to compensate for masking effect of smoking on detection of anaemia.[3] During past decade, it was suggested that cigarette smoking affect the blood characteristics as well that leads to death. For example, relation between smoking and white blood cell count has been well established.[4,6,7] In a number of studies, it has been found that smokers have higher white blood cell counts than non-smokers.[5,8,9,10] With this view present work was planned to study effects of smoking over various haematological parameters in young healthy adults.

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MATERIAL & METHOD

The present study work was conducted during last one year in our department. We included 70 healthy male subjects between the age group of 20-35 years

from MNRMC and Hospital, Sangareddy. Subjects were from staff members, residents and patients from routine OPD. Prior informed written consent was obtained after explaining the procedure and purpose of study tests. The Total Leucocyte Count (TLC) and the Differential Leucocyte Count (DLC) was done by coulter machine automated record.

Inclusion Criteria:

Case Group: Smokers with history of smoking for more than 5years with no history of any major illness like Hypertension, Diabetes Mellitus, and Peripheral Neuropathy in past or present were considered as case group for present study.

Control Group : Subjects who had never smoked in life and not having any other addiction related to tobacco and with no history of any major illness like Hypertension, Diabetes Mellitus ,Peripheral Neuropathy in past or present were considered as control group for present study. The detailed personal history of the participants like type of diet, habits, addictions, occupation and past history was recorded. We finalized sample size 70, with smokers (n=35) and control group included non-smokers (n=35).The study group included male smokers who have been smoking filtered cigarettes minimum 5 (maximum 10) per day with duration ≤ 10 yrs. Subjects suffering from coagulation disorders, diabetes, hypertension or any infection and those who are on any medication like aspirin or non-steroidal anti-inflammatory drugs (NSAIDs) were excluded from the study. All subjects were free from other habits like tobacco chewing and alcohol intake.

All the haematological parameters were done using blood collection and followed by coulter machine automated record. Statistical tests were done by using Instat 6 with experts.

RESULTS

In our study showed a statistically significant increase in the TLC from a mean value of 7442/cu.mm in non-smokers to about 8640/cu.mm in smokers (P< 0.01 & Z >2) and an increase in the lymphocyte count amongst the differential leucocyte counts in smokers (P< 0.01 & Z >2) as compared to non-smokers. (Table 1).

Table 1: Effect of cigarette smoking

Parameter n = 35	Smokers Mean ± SD	Non Smokers Mean ± SD	Z Value	P Value
1. T.L.C. (Cells/cu.mm)	8960 ± 844.9	7101.8±1169.6	4.5	P<0.001 Highly significant
2.D.L.C.(in%) Neutrophil	62.71 ± 5.64	65.97 ± 4.32	1.89	Not significant
Lymphocyte	30.37 ± 5.05	24.43 ± 3.95	3.78	P<0.001 Highly significant
Monocyte	1.89 ± 0.75	1.42 ± 0.6	0.52	Not significant
Eosinophil	1.68 ± 1.04	1.79 ± 0.87	0.38	Not significant
Basophil	0.4 ± 0.4	0.4 ± 0.4	0	Not significant

DISCUSSION

Our results showed that TLC count is more in smokers as compared to non-smokers. The marked increase in white cell count with smoking was seen even in subjects smoking 10 cigarettes per day or less. It is suggested that social habits such as smoking should be considered while interpreting blood haematology values. Changes in haematological results could be used to encourage a healthier lifestyle.[11] According to Whitehead TD et al, haemoglobin levels and PCV increase significantly in those smoking more than 10 cigarettes per day, but the effect on WBC count is seen even in subjects smoking less than 10 cigarettes per day.[15] Smoking is also considered as a major cause of polycythaemia and elevated haematocrit levels. In the present study, though the mean values for all these parameters in smokers are found to be higher than non-smokers, the difference is not statistically significant.[12,13,14] This can be possibly explained by the younger age group of the subjects with relatively less duration of smoking. In future we would like to extend our study in smokers of higher age group with duration of smoking more than 15 years. Increased leucocyte count along with raised C reactive protein levels is shown to be associated with increased

mortality rate in patients with ischemic heart disease. So, these can be considered as important prognostic markers in young smokers with ischemic heart disease. Alteration of lymphocyte count and an imbalance between T cell subsets contributes to the increased risk of infection and neoplasia in smokers. Hence smoking is considered as one of the major avoidable risk factors for cardiovascular diseases and death. Encouraging results have been observed in smokers who show a rapid return of many haematological abnormalities towards normal on abstinence from smoking. Also, the risk of adverse effects starts to decline quite rapidly after cessation of smoking. This fact is of immense importance for the young smokers who are otherwise free from other predisposing factors like obesity, hypertension, diabetes etc. So they have a bright future provided they stop smoking. [15, 16, 17]

CONCLUSION

From present study it may be concluded that smoking has direct effect on haematological parameters.

Conflict of Interest- Nil

Source of Funding- Self

Ethical Clearance- It was given by the institution.

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Heart Rate Variabilty and Glycemic Control with Regard to Duration of Type II Diabetes Mellitus

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ABSTRACT

Aim: To study HRV parameters in Type II Diabetes mellitus and to compare in relation to duration.

Materials and method: A total of 100 subjects in the age group of 30 to 70 years were included in the study of which 50 were diabetic patients and 50 were control groups. The study subjects of both sexes were divided in to three groups.

Group I – 50 Controls, age and sex matched healthy individuals.

Group II- 25 Type II diabetic patientswith disease duration less than 3 years of good glycemic control.

Group III – 25 Type II diabetic patients with disease duration less than 3 years of poor glycemic control.

HRV analysis is performed by measurement of successive RR interval variation and parameter of frequency domain measures such as LF/HF, LF, HF were analysed.

Results: In our study it is seen that all HRV parameters were significantly decreased in Diabetes when compared to normal controls,but there is no significant difference in HRV parameters with regard to duration. Poor glycemic control and increased duration of diabetes are the central key factors for the development of autonomic neuropathy. The decreased HRV parameters recorded in the absence of predominant symptoms of autonomic dysfunction indicates the early subclinical autonomic neuropathy in diabetes.

Keywords: *Autonomic Nervous system, Type II Diabetes mellitus, Heart Rate Variability.*

INTRODUCTION

Diabetes mellitus constitutes one of the heterogenous group of metabolic disease resulting in chronic hyperglycemia. One of the most important complications of type II Diabetes mellitus is impairment of autonomic activity with prevalence rate of 34%.

Nerve fibres in the autonomic nervous system undergoes early neurological degeneration because of chronic hyperglycemia and end up in a condition called Diabetic autonomic neuropathy. Disease manifests both clinically and sub clinically and affects all organ system of body. One of the earliest sign of autonomic dysfunction is reduced HRV detected even at subclinical stage.

The resting autonomic control of heart is reflected in a beat to beat fluctuations of heart rate on the R-R interval in the ECG. These variations in millisecond of the duration of one cardiac cycle from the other is known as Heart rate variability and is traditionally expressed in statistical measures of time domain analysis and as measures of spectral power under frequency domain analysis.

HRV is non-invasive and highly reproducible when obtained under resting condition which detects thesympathetic vagal balance at sinoatrial level.

MATERIALS AND METHOD

Study design: This is combined cross sectional and case control study.

The approval of ethical committee was obtained prior to the commencement of the study.

Study subjects:

A total of 100 subjects were included in the study of which 50 were diabetic patients and 50 were control groups. The subjects were of 30-70 years of age. All diabetic patients were taken from diabetic clinic of Coimbatore Medical college Hospital and controls were taken from general population in Coimbatore. The study subjects of both sexes were divided in to three groups.

Group I – 50 Controls, age and sex matched healthy individuals.

Group II- 25 Type II diabetic patients with good glycemic control (HbA1C ≤ 7) with disease duration less than 3 years

Group III – 25 Type II diabetic patients with poor glycemic control (HbA1C ≥ 7)with disease duration less than 3 years.

Materials used for the study:

Neuroperfect EMG 2000 system with installed HRV software.

Autoanalyser- to analyse plasma sugar and HbA1C level.

Study protocol involved:

1. Recording of detailed history including duration of diabetes.

2. A thorough clinical examination of study subject.

3. Measurement of blood sugar and HbA1C level.

Procedure for recording HRV.

HRV analysis is performed by specially equipped Electro diagnostic procedure room. Initially patient is asked to lie down comfortably and ECG leads are to be connected and HRV analysis performed by Medicaid software installed previously in to the instrument system. Measurement of HRV will be done for a period ranging from 5 minutes interval. Lead II ECG recordings were traced. HRV analysis is performed by measurement of successive RR interval variation and parameter of frequency domain measures such as LF/HF, LF, HF are analysed.

RESULTS

TABLE1: COMPARISON OF HRV PARAMATERS BETWEEN GROUP (II & III) WITH GROUP I.

HRV PARAMATERS	GROUP II & III (n=50)	NORMAL CONTROLS (n=50)	T VALUE	P VALUE
	MEAN ±SD	MEAN ±SD		
LF (ms^2)	71.2±129.2	332.1±243.7	6.703	0.00*
HF (ms^2)	13.1±28.6	68.5±73.0	5.001	0.00*
LF/HF	5.7±1.98	5.5±1.28	0.599	0.551

*P value statistically significant

INFERENCE:

All the parameters except the ratio of LF/HF are significantly reduced in diabetic group when compared to normal controls.

TABLE 2: COMPARISON OF HRV PARAMATERS BETWEEN GROUP II A1 & III A1

HRV PARAMATERS	GROUP II A1	GROUP IIIA1	T VALUE	P VALUE
	MEAN ±SD	MEAN ±SD		
LF (ms^2)	147.3±221.0	24.5±13.04	1.339	0.19
HF (ms^2)	31.5±50.68	4.33±1.75	1.294	0.21
LF/HF	5.18±1.74	4.83±2.04	0.388	0.70

INFERENCE

There is no significant difference between controlled & uncontrolled glycemic group with disease duration less than 3 years.

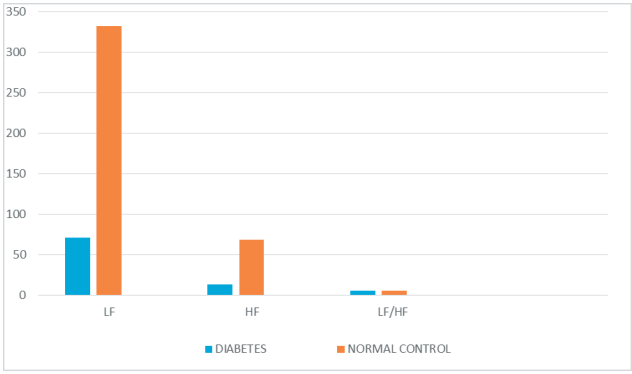

Figure 1: Comparison of HRV paramaters between group (II & III) with group I

Stastical analysis:

Independent t test has been used for intergroup comparison of the parameters of HRV. Stastical software namely SPSS 17 version was used for analysis of data.

DISCUSSION

The present study done on 50 diabetes and 50 controls in the age group of 30-70 years. LF,HF, except LF/HF ratio was significantly reduced in Group II and III compared to Group I.HF component represents parasympathetic activity. LF represents both sympathetic and parasympathetic activity and LF/HF ratio reflects major sympathovagal balance .In our study it is seen that all HRV parameters were significantly decreased in Diabetes when compared to normal controls. The decreased HRV parameters in diabetes except LF/HF ratio may be due to the fact that there is decreased modulation of sympathetic and parasympathetic supply of heart without any shift in the two limbs of autonomic supply. This indicates the early damage in autonomic nerve fibres due to hyperglycemia induced nerve ischemia and axonal degeneration, Where as there is no significant difference in LF, HF, LF/HF ratio between Group II and Group III .

In our study we did not find any significant difference in HRV parameters between good and poor glycemic control less than 3 years. HRV for a newly diagnosed diabetes up to 3 years of duration is similar to non-diabetics. This finding in our study was consistent with EURODIAB IDDM complication study where micro vascular complications are related to duration of diabetics in which decrease in HRV parameters occurs when duration of diabetes gets increased to more than 3 years.

Poor glycemic control and increased duration of diabetes are the central key factors for the development of autonomic neuropathy. The decreased HRV parameters recorded in the absence of predominant symptoms of autonomic dysfunction indicates the early subclinical autonomic neuropathy in diabetes.

Detection of subclinical neuropathy in diabetes is essential to prevent the unexpected neuropathic complications like sudden cardiac death, cardiac arrhythmias.

Though hyperglycemia itself as the contributing factor for reduced HRV but in our study it is evident that only long term hyperglycemia is mainly responsible for derangement of nerve fibres. This may be due to the fact that as the diabetic duration increases the nerves are exposed to chronic hyperglycemia.

CONCLUSION

The possible molecular mechanisms for the development of decreased HRV in diabetes could be due to the fact that the nerve fibres are exposed to

- Increased intracellular sorbitol level.
- Decreased myoinositol and ATPase activity.
- Hyperglycemia induced formation of advanced glycation products in peripheral nerves.
- Oxidative stress gets increased leading to decreased ATP formation resulting in impaired nerve function.

The most effective therapy for Diabetic autonomic neuropathy is prevention. Intensive glycemic control will delay the development or slow the progression and may even reverse the complication of diabetic neuropathy, of which HRV is one of the most reliable reproducible method for detecting early autonomic dysfunction. Hence it should be recommended wherever possible and this must be added to the first of screening tools for a complete and early assessment of neurological involvement of diabetic patients to advise them for an early and proper management of disease.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Taken

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Assessment of Nutritional Status and Anaemia among First Year Medical Students of SIMS, Shivamogga

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ABSTRACT

Background: The medical students may also suffer from anaemia because of busy schedule in college and extra-curricular activities. Their living in the hostel or as day scholars away from parents and families was reflected upon their diet habits and had a significant reflection upon the prevalence of anaemia.

Aims & Objectives: To determine haemoglobin status and body mass index (BMI) in adolescents and to study the correlation between them.

Materials and Method: The present study was conducted on 100 Ist year MBBS students studying at Shimoga Institute of Medical Sciences, Shivamogga (Karnataka) belonging to both sex during 2014-15. They were studied for anthropometric parameters using standard protocol. BMI of </=18.5 kg/m2 was used to define undernutrition status. Haemoglobin level was estimated. Grading of Anaemia according to WHO guidelines was done. Peripheral smears were studied. Statistical analysis were carried out using proportions, means, standard deviations and SPSS software.

Results: Anaemia prevalence was 32% among medical students. Out of total 62 male students, 15(24.19%) students were found anaemic and out of 38 female students, 17(44.73%) were found anaemic. Out of 62 male students, 17 were underweight and 6 were overweight. Out of 38 females, 10 were underweight and 6 were overweight. There was negative correlation between BMI and Hb levels.

Conclusion: In this study, girl students showed poor nutritional profile and higher prevalence of anemia as compared to the boys. Nutritional anaemia was found to be prevalent even in medical students who were literate and had access to the nutritive diet in a good, healthy environment. The need for regular blood tests, especially haemoglobin levels, is emphasized and nutrition component needs to be included in the college curriculum.

Keywords: *Anaemia, BMI, Nutritional status.*

INTRODUCTION

Nutritional anaemia is prevalent all over the world with an estimated one billion people being iron deficient. And it is one the most common nutritional disorder in the developing world, With an average prevalence of 40% among the general population that it affect nearly two-third of pregnant and one half of non pregnant women in those countries which is three to four times higher than in the developed countries, where prevalence is between 4% to 12% among women of child bearing age.[1]

Anaemia is a serious public health and nutrition problem affecting both developing and developed countries, with major consequences on human health as well as social and economic development. Nutritional Anaemia is of more concern in the developing countries having high prevalence rate due to dietary iron deficiency. The other causes of Anaemia are heavy menstrual blood loss, parasitic infections, acute and chronic infections, micronutrient deficiency, and haemoglobinopathies.[2]

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Measuring height, weight, and body mass index (BMI) gives significant information on the nutritional and health status of individuals. Many research studies have reported that malnutrition affects body growth and development, especially during the crucial period of adolescence.[3]

Keeping in view the increasing incidence of nutritional Anaemia in urban population, we conducted a study to estimate the prevalence of Anaemia among affluent educated class of young medical students and its correlation with BMI.

AIMS AND OBJECTIVES

To measure the prevalence rate of anaemia among first year medical students of Shimoga Institute of Medical Sciences, Shivamogga; by

1. Determining haemoglobin status by Sahli's haemoglobinometer.
2. Determining Body Mass Index.
3. Correlating above two parameters.

MATERIALS AND METHOD

100 Ist year MBBS students studying at Shimoga Institute of Medical Sciences belonging to both sex were enrolled in this study been done during 2014-15.

- They were studied for anthropometric parameters (height and weight) using standard protocol.
- BMI of </=18.5 kg/m2 was used to define undernutrition status, 18.6-24.99 kg/m2 as adequate nutrition and >25kg/m2 as overnutrition.[4]
- Haemoglobin level was estimated by Sahli's haemoglobinometer method. Males with Hb <13gm% and females with Hb<12gm% were considered as anaemic according to WHO guidelines.[5]
- Peripheral smears were studied.

STATISTICAL ANALYSIS

- Proportions, means and standard deviations are reported.
- Pearson's correlation was performed on the variables measured, with level of significance (p) at 0.05.
- Data were entered into Microsoft Excel spreadsheet and statistical analysis was done using SPSS version 20.

RESULTS

In our study, anaemia prevalence was 32% among 100 1st year medical students. Out of total 62 male students, 15(24.19%) students were found anaemic and out of 38 female students, 17(44.73%) were found anaemic. Out of 62 male students, 17 were underweight and 6 were overweight. Out of 38 females, 10 were underweight and 6 were overweight. There was negative correlation between BMI and Hb levels.

Table 1 shows, a statistically significant difference between the anthropomorphic parameters of girls and boys. The mean value of haemoglobin concentration among girl students was (11.7 ± 0.9 gm%) and was less than that observed in boys (13.34 ± 1.13 gm%), which was physiologically expected.

Table 2 shows, among 38 girl students, 17 (44.73%) were found to have Anaemia with haemoglobin <12 g%; of 62 male students, 15 (24.19%) were found to have Anaemia with Hb <13gm% as per WHO guidelines.

Table 3 shows, among 38 girl students, 22 (57.89%) were having BMI between 18.5 and 24.99 kg/m2 (adequate nutrition), 10 (26.31%) were underweight, and 6 (15.78%) were overweight. Among boys, 39(62.9%) were having normal BMI between 18.5 and 24.99 kg/m2, 17 (27.41%) were found to be underweight, and 6(9.67%) were overweight. Undernutrition was observed in 10 (26.31%) girls as compared to the 17 (27.41%) boys with BMI <18.5 kg/m2.

Table 4 shows the correlation of haemoglobin with different grades of BMI, with weak positive correlation in both boys and girls. However, none of the correlation achieves significance to the levels of <0.05. It is seen more clearly through scatter diagram.

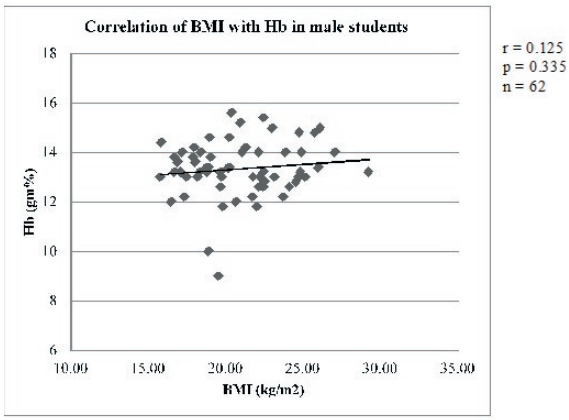
Table 1: Anthropometric & blood parameters (n=100)

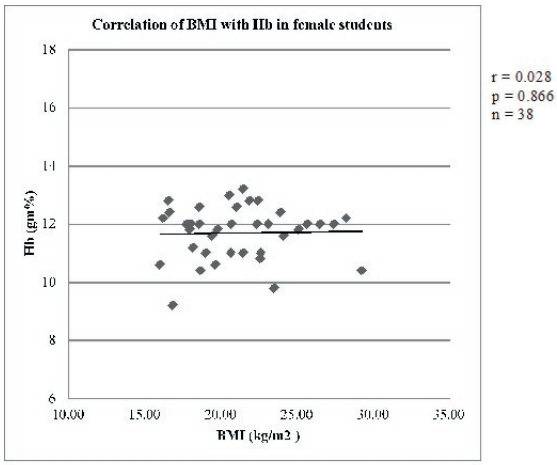
PARAMETERS	BOYS (n=62)	GIRLS (N=38)	P value
Height (cm)	169.548 ± 6.68	158.6 ± 5.2	< 0.001
Weight (kg)	60 ± 9.53	53.15 ± 9.68	0.001
BMI (kg/m^2)	20.88 ± 3.14	21.09 ± 3.48	0.752
Haemoglobin (gm%)	13.34 ± 1.13	11.7 ± 0.9	< 0.001

Table 2: Distribution of students according to category of anaemia (WHO classification)			
CATEGORY	**Hb (gm%)**	**Anaemic**	**Non-anaemic**
BOYS (62)	<13	15 (24.19%)	47 (75.8%)
GIRLS (38)	<12	17 (44.73%)	21 (55.26%)

Table 3: Distribution of students as per BMI criteria (IOTF-2000)			
NUTRITIONAL STATUS	BMI (kg/m2)	**BOYS (n=62)**	**GIRLS (n=38)**
Undernutrition	<18.5	17	10
Adequate	18.5-24.99	39	22
Overnutrition	>25	6	6

Table 4: Correlation of Hb with BMI grades in boys and girls				
BMI (kg/m2)	**BOYS (n=62)**		**GIRLS (n=38)**	
	r	**Significance(p)***	**r**	**Significance(p)***
<18.5	0.111	0.673	0.106	0.770
18.6-24.99	0.158	0.337	0.146	0.539
>25	-0.244	0.642	-0.557	0.250





DISCUSSION

The Nutritional anaemia is the most common cause of anaemia worldwide. It frequently occurs due to inadequate iron intake, chronic blood loss or disease, malabsorption, or a combination of all these factors. It affects one's development, growth and resistance to infections, and is associated with mortality among children younger than two years old[6]. Iron Deficiency Anaemia is also a form of Nutritional anaemia which is distributed universally; the most affected population groups are infants aged between four and 24 months old, school-age children, female adolescents, pregnant women and nurturing mothers.

Adolescence is characterized by a spurt in physical growth and acquisition of adult phenotypes and biological rhythms. During this period, there is increase in iron requirements related to rapid growth and increase in lean body mass in both boys and girls as a result of the expansion in total blood volume. The consequences of iron deficiency are more serious in young females due to onset of menses. However, along with iron-deficiency anemia, reduced physical endurance, impaired immune response, difficulty in temperature regulation, changes in energy metabolism, and a decrease in cognitive performance have also been observed.[7] Although malabsorption and bleeding are regarded as two main

causes of iron-deficiency anemia, the overwhelming cause is dietary.

Although nutritional anemia has global impact; it is of more concern in the developing countries. Unfortunately, it is not restricted to adolescents of rural and low socioeconomic status but also shows increased prevalence in developed opulent society.[8]

Worldwide, about 24.8% of the population is affected by anemia, with highest prevalence of 47.4% in preschool children and the lowest prevalence of 12.7% in men. The regional estimates of WHO indicate that the highest proportion of population with nutritional anemia is in Africa (47.5%–67.6%) whereas the greatest number of individuals affected are in South East Asia.[9]

In the present study, 44.73 % girls and 24.19 % boys were found to have anemia. According to the National Family Health Survey 3, conducted in 2005–06, the national estimate of prevalence of anemia in adolescent girls was 56%, which is consistent with our study results. The prevalence of anemia among the adolescent girls aged 11–18 years was found to be 25%–80% in several previous studies conducted by the Indian Council of Medical Research in 16 districts of 11 states.[10] Higher prevalence of anemia in 32% was also reported among adolescent urban girls of Nagpur.[11] A study conducted in rural adolescent girls of Wardha, Maharashtra, India, found to have prevalence of anemia was found to be 59.8%.[12] Peter et al.[13] reported that 77.41% urban girls and 77.90% rural girls had hemoglobin level <10 g%. Higher prevalence of anemia was also found in 98% of rural girls and 56% of rural boys in Punjab.[14]

The study conducted by Saxena et al.[15] showed low prevalence of anemia to be 8% among adolescents, with none of the boys having hemoglobin levels less than 12 g%. In our present study, nutritional anemia was observed in only two (1.7%) boys, a finding that is consistent with the above study.

It has been suggested that increased testosterone concentration in adult men is associated with an increase in the concentration of erythropoietin and hemoglobin.[16] In a study conducted in adolescent girls of Shimla hills, low prevalence of anemia was seen in 21.4%. It may be due to the higher altitude where chance of anemia is reported to be lesser.[17,18]

The prevalence of iron deficiency varies greatly according to a host of factors such as age, gender, physiological causes, pathological causes, nutritional factors, environmental factors, and socioeconomic conditions. The present study was conducted at an urban medical college in north India with adolescents having better health and environmental conditions. The reason for high prevalence of anemia the girls could be due to less food intake in tendency to lose weight for achieving zero figure, combined with menstrual loses.[15] In our study, 6 (9.67%) boys were overweight as compared to 6 (15.78 %) girls.

Negative association between haemoglobin and BMI, in some of the previous studies could have been related to the reduction in levels of estrogen-binding protein with increasing adiposity (BMI) resulting in rise of free estrogen levels, which may cause suppression of erythropoiesis in girls.[19] Obesity has been reported to be associated with anemia, which may be due to upregulated hepcidin expression, thereby hampering iron absorption.[20]

CONCLUSION

In this study, girl students showed poorer nutritional profile and higher prevalence of anemia as compared to the boys. Nutritional anemia was found to be prevalent even in medical students who were literate and had access to the nutritive diet in a good, healthy environment.

Hence, there is an urgent need for improving overall nutritional status of adolescents through nutrition education, community awareness, and various supplementation programs, especially for girls. The need for regular blood tests, especially hemoglobin levels, is emphasized and nutrition component needs to be included in the college curriculum.

Source of Funding: Self

Conflict of Interest: Nil

Ethical Committee Clearance: Taken

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A Comparitive Study of Impact of Obesity on Static Lung Volumes and Capacities in Young Adult Women

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ABSTRACT

Background: The Prevalence and severity of obesity in young adult women is dramatically increasing worldwide. Along with other organs respiratory system is also compromised. Obesity is likely the cause of pulmonary function decline which is linked to early morbidity and mortality. The study was undertaken to assess the Static pulmonary function tests in obese and non -obese young adult women of Hubli city of 18-30 years age group, randomly selected from the general population satisfying inclusion and exclusion criteria.

Aims and Objectives: The purpose of this study was to compare Static Lung Volumes and Capacities parameters in obese adult females and non-obese adult female subject, to evaluate the impact of obesity on Pulmonary Function Test Parameters.

Materials and Method: Pulmonary Function tests (PFTs) of 50 normal, healthy, non-obese females and 50 healthy but obese females, age group 18-30 years of Hubli city were determined and were compared. Criteria for obesity in our study taken were according to WHO criteria of BMI. The pulmonary function test was carried out with computerized Spirometer Eazy on-PC model. Static Lung Volumes and Capacities parameters were used as measure of lung function.

Results: In our study Obese females had VC (litres)of 2.37±0.65, ERV (litres) of 0.4±0.58 , IRV (litres)of 1.11±0.67 , IC(litres) of 1.76±0.2 , TV(litres)of 0.64±0.3 compared to non-obese Females. Static pulmonary function test parameters in Young adult females showed a negative correlation with obesity which was statistically significant

Conclusion: In our study it was found that obesity had an inverse association with the Static lung volumes and Capacities parameters as indicated by decrease in VC, IRV, IC, TV. Hence from the present study we conclude that static lung volumes and capacities parameters of obese adult females were significantly reduced when compared to the normal weight counterparts.

Keywords : *Obesity; Adult Women; Pulmonary function test(PFT);Slow Vital Capacity; Easy On-PC Model*

INTRODUCTION

Obesity negatively impacts the health of women in many ways. Being overweight or obese increases the relative risk of diabetes and coronary artery disease in women. The prevalence of obesity in young adult women is rising, the World Health Organization estimates that more than 1 billion people are overweight, with 300 million meeting the criteria for obesity. Twenty-six percent of non-pregnant women ages 20 to 39 are overweight and 29% are obese. Obesity can cause various deleterious effects to respiratory function, such as alterations in respiratory mechanics, decrease in respiratory muscle strength and endurance, decrease in pulmonary gas exchange, lower control of breathing

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and limitations in pulmonary function tests and exercise capacity.[1]

Obesity can profoundly alter pulmonary function by its adverse effects on respiratory mechanics, resistance within the respiratory system, respiratory muscle function, lung volumes, work and energy cost of breathing, control of breathing and gas exchange. It causes changes in the respiratory mechanics, muscular contraction and strength, pulmonary gas exchange, respiratory control, lung function tests and exercise capacity. Obesity has profound effect on the physiology of breathing. It can lead to pulmonary compromise in a number of ways including decrease in respiratory compliance due to mechanical factors such as increased weight on the thoracic cage and abdomen as well as changes in lung compliance. The major respiratory complications of obesity includes a heightened demand for ventilation, elevated work of breathing, respiratory muscle insufficiency and diminished respiratory compliance. [1]

Obesity is likely the cause of pulmonary function decline. Respiratory function is determined by interaction of lungs, Chest wall and muscles. Obesity reduces chestwall compliance, respiratory muscle function and peripheral airway size.[10]

Therefore Present study was done to Know the Impact Of Obesity On Pulmonary Function test Parameters in Young Adult Females.

MATERIALS AND METHOD

The present study was done in the department of physiology, KIMS, Hubli. Data is collected from 50 non-obese adult women of 18-30 years BMI 30 kg/m^2 and 50 obese adult women of 18-30 years BMI 30 kg/m^2 and above, selected randomly from general population satisfying the Inclusion and the Exclusion criteria. The evaluation of pulmonary Function was performed by Spirometry using an Eazy on-PC model, computerized Spirometer (nddmedizintechnik AG), Zurich. The study and the control group were selected based on inclusion and exclusion criteria.

INCLUSION CRITERIA

(i) Age 18-30 year

(ii) Individuals falling within the range of normal and obese Body mass Index

(iii) Healthy Individuals

(iv) Sedentary

(V) Non-Smokers

EXCLUSION CRITERIA

(i) Smokers

(ii) Those who have physical deformities of chest wall

(iii) Patient showing obstructive or restrictive alterations in the pulmonary function tests

(iv) Obstructive sleep apnea syndrome

(v) Individuals with history of chronic exposure to substances which results in altered pulmonary function, History of hypertension, diabetes mellitus and cardiovascular diseases

(vi) Subjects with noticeable weight gain over preceding 3 months

The protocol of the study was approved by the institutional ethical committee .The procedure was explained to the subjects and the importance of the test was also briefed to the subjects. Then the selected group of subjects were categorized into non-obese and obese based on the chart provided by WHO for body mass index BMI (kg/m^2

<18.5	Underweight
18.5-24.99	Normal Weight
25- 29.99	Overweight
30 and above	Obese

Anthropometric parameters:

(i)Height: Standing height was measured in centimeters nearest to 1 cm with a measuring tape attached over a wall. While measuring the height, the subject removed their shoes and the subject stands with his heels together, stretching upwards to full extent their back is as straight as possible with relaxed abdomen.

(ii) Weight: was measured in kilograms on an empty bladder, empty stomach on a standarised digital weighing machine to the nearest 0.1kg, while measuring the weight the subject removed their shoes and wore least possible clothing.

(iii) BMI: was calculated based on the Quetelets index,

BMI = Weight (in kgs)/Height ^{2}(in meters)

The subject who had BMI < 30 kg/m^2 were considered as non- obese. The subjects with a BMI 30 kg/m^2 and above were considered as obese:

SPIROLYSER

The evaluation of pulmonary function was performed by Spirometry using an Easy on- PC model, Computerized spirometer (nddmedzintechnik AG CH- 8005) Zurich, Switzerland. It plugs directly into the USB port of a PC. It works on ultrasonic Doppler principle. The directly evaluated parameters were lung volumes, capacities, and Flow through the procedures of Slow Vital Capacity (SVC), at least three times each, according to the standards of American Thoracic Society (ATS) with the volunteers in the sitting position. Results were expressed as absolute values and as percentage of the reference predicted values. By means of SVC procedure, it was possible to obtain the following variables Tidal volume(TV), Vital capacity(VC), Inspiratory Reserve Volume(IRV), Inpiratory Capacity (IC), Expiratory Reserve Volume(ERV).

RESULTS

Evaluation of static and lung functions were carried out on both the groups by using computerized spirometer easy on-PC model. The obtained data was tabulated, analysed and expressed as Mean ± Standard Deviation (Mean ± SD) to assess anthropometric, and various Pulmonary Function Test parameters in the 2 groups. The statistical software, SPSS is used for the analysis of the data and Microsoft and Excel have been used to generate graphs, tables etc. In order to compare the level of PFT parameters between the two groups, the unpaired student's 't' test was applied and statistical significance was indicated by 'P' value less than 0.05($p<0.05$).

ANTHROPOMETRIC DATA:

Age (yrs): The mean (±SD) age of obese females was 24.82±3.2 and of controls was 22.98±3.3.There was no statistically significant difference between the two groups.

Height (cm): The mean (±SD) height in obese females was 131.54±19.6 and that in non-obese females was 137.09±9.10.There was no statistically significant difference between the two groups.

Weight(kg):The mean (±SD)weight in obese females was 75.44±9and in non-obese females was 58.74±9.9.There was statistically significant difference between the two groups.

Body Mass Index (BMI**):** The mean(±SD) in obese females was 33.72±3.54 and in non-obese females was 22.71±2.8. There was statistically highly significant difference between two groups ($p<0.001$).

SLOW VITAL CAPACITY PARAMETERS: SVC parameters for obese and non-obese females is shown in table.

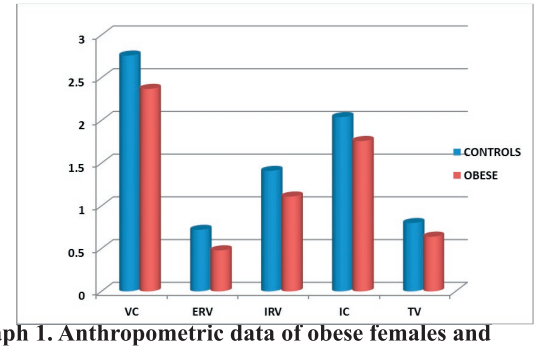
Vital Capacity (VC): the obese females had VC (litres) 2.37±0.65 whereas the values in non- obese was 2.76±0.67. The vital capacity was less in obese females than in non-obese females. There was statistically significant differences between two groups ($P<0.05$).

Expiratory Reserve Volume (ERV): obese females had ERV (litres) of 0.4±0.58 whereas the corresponding value in non-obese was 0.72±0.42. There was no statistically significant difference between two groups.

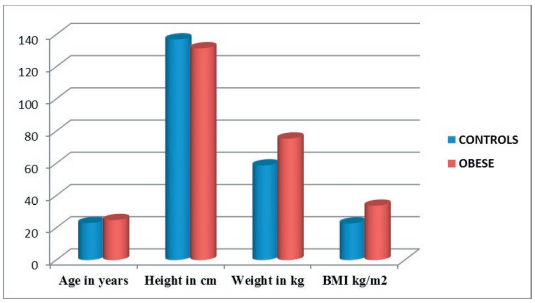
Inspiratory Reserve Volume (IRV): obese females had an IRV (litres)of 1.11±0.67 whereas corresponding values in non-obese was1.41±0.62. There was statistically significant difference between two groups ($P<0.05$).

Inspiratory Capacity (IC): The obese females had IC(litres) of 1.76±0.2 whereas values in correspondent non-obese was 2.04±09. There was statistically significant difference between two groups(<0.05).

Tidal volume(TV): The obese females had TV(litres)of 0.64±0.3 whereas corresponding values in non-obese was 0.80±0.37. There was statistically significant differences between two groups ($p<0.05$).



Graph 1. Anthropometric data of obese females and controls



Graph 2. Slow vital capacity parameters of obese females and controls

DISCUSSION

Many studies have demonstrated an association between obesity and ventilator abnormalities in adult females. The present study showed that there was no significant differences in age or height between two groups studied indicating that samples were homogeneous in this respect. But the weight and BMI were significant difference between the control and the group studied (table 1).

Vital capacity(VC): The obese females had a vital capacity (Litres) of 2.37±0.65.Whereas correspondent controls was 2.76±0.6. The vital capacity was less in obese females than in non-obese females. This was statistically significant (P< 0.05). Estimation of VC allows assessment of maximum Inspiratory and Expiratory efforts, and this gives usefull information about the strength of respiratory muscles. The results of the present study was consistent with the study done by Ray CS et al. in their study 43 massively obese individuals were studied which showed significant increase in the vital capacity after weight loss.[3]K P Fung et al. studied on overweight Females also found decrease in the vital capacity. By decreasing the expiratory reserve volume, the abdominal fat reduces the vital capacity.[2] Costa D et al. in their study among 20 obese women between 20 and 35 years also found changes in the components of vital capacity. These changes in lung function are caused by extra adipose tissue in the chest wall and abdominal cavity, compressing the thoracic cage, diaphragm and lungs. The consequences are a decrease in diaphragm displacement, a decrease in lung volumes.[1]

Expiratory Reserve Volume (ERV): The obese females had ERV 0.48±0.58, whereas correspondent controls had 0.72±0.42.Obese group had lesser ERV than non-obese but there was not much statistically significant difference between two groups (P>0.05). Costa D et al. in their study have found lower Expiratory reserve Volume in obese females, due to probable lung compression.[1] Psthomas et al. in their study have stated the benefits of loss of weight on lung function in the morbidly obese. There was a significant improvement in lung function, most notably a 54% increase in ERV and improvement in gas exchange. Obesity probably causes respiratory embarrassment by several mechanisms. Their study emphasized that ERV, FRC and TLC are reduced by comparison with values after weight loss, most of the change in TLC being accounted for by a change in ERV and RV.[7] Lynell C et al. in their study have stated obesity has been associated with respiratory complications such as obstructive sleep apnea and obesity hypoventilation syndrome, and it is believed to reduce lung volumes. Obese persons may have decreased expiratory reserve volumes, particularly when in the recumbent position.[6] Perran Borran et al. have stated the most common abnormalities reported due to the effects of obesity on pulmonary function are reduced Expiratory Reserve volume and functional residual capacity due to reduced chestwall and lung compliance and increased respiratory resistance. They further state that increased pulmonary blood volume leads to congestion resulting in thickening of the airway wall, thus reducing airway size.

Inspiratory Reserve Volume (IRV): The obese females had IRV 1.11±0.67, whereas correspondent controls had 1.41±0.62, obese group had lower Inspiratory Reserve compared to non-obese. There was statistically significant difference between two groups. Costa D et al. in their study have found increase in Inspiratory Reserve Volume due to damage to the ventilator mechanics by obesity. [1]

He decrease in inspiratory reserve volume in obese females could be probably due to decrease in diaphragm displacement and decrease in lung and chestwall compliance due to compression of thoracic cage, diaphragm and lung and chestwall by extra adipose tissue in the chestwall and abdominal cavity.

Inspiratory Capacity(IC): Obese females had IC1.7±0.6, whereas correspondent controls had 2.04±0.59, obese group had lower IC Compared to non-obese controls. There was statistically significant difference between two groups ($p<0.05$). Rasslan et al. In their study have found that inspiratory capacity was higher in obese individuals than in non-obese. They suggested that this may indicate normal lung compliance and an ability of the respiratory muscles to compensate, though temporarily, for the excess weight on the chest and abdomen.[5]

Tidal volume (TV): Obese females had TV 0.64±0.30 and whereas correspondent controls had TV 0.84±0.37, obese females had lower TV than controls. There was statistically significant difference between two groups($p<0.05$). StephenW.et al. in their study have found higher respiratory rate and lower tidal volumes. Airway resistance is usually increased in obese individuals and this is partly related to lower lung volumes.[9]

CONCLUSION

A comparative study of pulmonary function tests in obese adult women in and around Hubli was conducted in the department of Physiology, KIMS, Hubli. This type of study is entirely new to this geographical area and this study intends to find the alteration in the pulmonary functions in young adult obese females as compared with the normal weight individuals, particularly in this part of the country. The study was done to determine the effects of obesity on pulmonary function in young adult females.

In this study it was found that obesity had an inverse association with the Slow Vital Capacity Parameters as indicated by decrease in VC, IRV, IC, TV values were significantly reduced in obese females compared to non- obese. Hence from the present study we conclude that pulmonary function test parameters of obese adult females were significantly reduced when compared to the normal weight counterparts. Obesity had significant impact on pulmonary function test parameters in young adult females of Hubli city.

Ethical Clearence : Ethical clearance has been obtained from Ethical Committee of KIMS, Hubli.

Source of Funding : Self

Conflict of Interest: Nil

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Assessment of Pulmonary System Adaptability in Sprint Athletes

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ABSTRACT

Background: The degree of adaptability of the respiratory system in delivering the physiological needs in case of severe exercise is a topic of considerable differences among workers in the field. Role of the normal respiratory system in delivering oxygen to meet the demands of various degrees of exercise has been a topic of considerable debate .One view holds that the respiratory system is not normally the most limiting factor in the delivery of oxygen, others hold the absence of structural adaptability to physical training cause of limitation of the pulmonary system. The role of ventilator functions in evaluating the respiratory functions in sprint runners has not been studied adequately in previous studies. Hence the need for this study.

Method: Pulmonary Function Tests were done before & after maximal exercise testing to assess dynamic lung functions in two groups' viz., athletes & non-athletes.

The athletes were sprinters.

Results: On studying the differences in dynamic lung functions in two groups of non-athletes and athletes, there was no difference in FVC& FEV1, before or after exercise testing in either .The other flow rates MMEF, PEFR, MEF 25% to 75% were on the higher side in trained subjects which was consistently maintained after exercise testing .A higher adaptability of the respiratory system to the training stimulus in the form of a higher elastic recoil pressure of the lungs and a lower resistance of medium to small airways is suggested as the mechanism of adaptability in this study.

***Keywords**: - Exercise Testing, Airflow Limitation, Dynamic Lung Functions, Ventilatory functions, sprint runners*

INTRODUCTION

There are diverse opinions about the degree of adaptability of the respiratory system in delivering the physiological needs in case of severe exercise. There are reports that the respiratory System is not normally the most limiting factor in the delivery of oxygen to the muscles during maximal muscle aerobic metabolism whereas others do not subscribe to this[1].

Mechanical constraints on exercise hyperpnoea have been studied as a factor limiting performance in endurance athletes' [2]. Others have considered the absence of structural adaptability to physical training as one of the "weaknesses" inherent in the healthy pulmonary system response to exercise [3]

Ventilatory functions are an important part of functional diagnostics[4], aiding selection and optimization of training and early diagnosis of sports pathology. Assessment of exercise response of dynamic lung functions in the healthy pulmonary system in the trained and the untrained has a role in clearing gaps in the above areas.

MATERIAL AND METHOD

The present study was conducted in the department of physiology, KIMS, Hubli as a part of cardio-pulmonary efficiency studies on two groups of non-athletes (n=30) and athletes (n=30) comparable in age & sex.

Informed consent was obtained and clinical examination to rule out any underlying disease was done. Healthy young adult males between 19-25 years who regularly undergo training and participate in

competitive sprint running events for at least past 3 years were considered in the athlete group whereas the non-athlete group did not have any such regular exercise program. Smoking, clinical evidence of anemia, obesity, involvement of cardio-respiratory system was considered as exclusion criteria.

Detailed procedure of exercise treadmill test and computerized spirometry was explained to the subjects.

Dynamic lung functions were measured in both groups before exercise was evaluated following standard procedure of spirometry using computerized spirometer Spl-95. All subjects were made to undergo maximal exercise testing to VO2 max levels on a motorized treadmill.

After exercise, the assessment of dynamic lung functions was repeated. All these set of recordings were done on both the non-athlete as well as the athlete groups.

Statistical analysis was done using paired students t-test for comparing parameters within the group before & after exercise testing and unpaired t-test for comparing the two groups of subjects.

A p-value of < 0.01 was considered as significant.

RESULTS

Table 1 Comparison of anthropometric data & VO2 max of non-athletes & athletes with statistical analysis.

Parameter	Non-Athletes	Athletes	P- value	Remarks
Age (Yr)	21.48 ± 2.62	21.45 ± 2.89	< 0.10	NS
Height (cm)	167.70 ± 7.50	164.90 ± 7.24	< 0.10	NS
Weight (kg)	61.06 ± 5.64	60.43 ± 6.26	<0.10	NS
BMI (kg/m²]	21.02 ± 2.47	21.61 ± 1.75	< 0.10	NS
VO2 max(lit/min)	2.98±0.16	3.04±0.27	< 0.001	HS

NS=Not significant, P< 0.01 Significant, P< 0.001 Highly Significant, Degree of freedom=58

Table 2: Comparison of Dynamic Lung Functions of Non- Athletes before exercise testing (BE) & after exercise testing (AE) with statistical analysis.

NON-ATHLETES (n=30)

Parameter	BE	AE	P- value	Remarks
FVC (L)	3.57 ± 0.52	3.35 ± 0.56	< 0.10	NS
FEV1 (L)	3.57 ± 0.50	3.28 ± 0.05	< 0.05	NS
FEV1/FVC	0.94	0.95		
MMEF (L/S)	4.98 ± 1.31	4.98 ± 1.46	< 0.10	NS
PEFR (L/S)	7.21 ±1.78	6.71 ±1.96	< 0.10	NS
MEF 75(L/S)	6.43 ±1.94	5.87 ±1.74	< 0.10	NS
MEF 50(L/S)	5.46 ± 1.44	5.44 ± 1.63	< 0.10	NS
MEF 25(L/S)	3.48 ± 1.16	3.72 ± 1.47	< 0.10	NS

NS = Not Significant, P< 0.01 is considered significant, Degree of freedom =29.

Table 3: Comparison of Dynamic Lung functions of Athletes before exercise testing (BE) & after exercise testing (AE) with statistical analysis. ATHLETES (n=30)

Parameter	BE	AE	P- value	Remarks
FVC (L)	3.12 ± 0.39	3.13 ± 0.30	< 0.05	NS
FEV1 (L)	3.18 ± 0.30	3.08 ± 0.30	< 0.05	NS
FEV1 /FVC	0.99	0.99		
MMEF (L/S)	6.07 ± 1.21	6.43 ± 1.07	< 0.1	NS
PEFR (L/S)	8.71 ±1.09	8.58 ± 0.84	< 0.1	NS
MEF 75(L/S)	8.28 ±1.28	8.15 ±1.13	< 0.1	NS
MEF 50(L/S)	6.39 ± 1.20	6.84 ± 0.92	< 0.1	NS
MEF 25(L/S)	4.35 ± 1.11	5.02 ± 1.05	< 0.05	NS

NS = Not Significant , P< 0.01 is considered significant, Degree of freedom =29.

Table 4: Comparison of Dynamic Lung function of Non-Athletes & Athletes before exercise testing with statistical analysis.

Parameter	Non Athletes	Athletes	P- value	Remarks
FVC (L)	3.57 ± 0.52	3.31 ± 0.39	< 0.05	NS
FEV1 (L)	3.53 ± 0.51	3.26 ± 0.35	< 0.05	NS
FEV1 /FVC	0.95	0.99		
MMEF (L/S)	4.90 ± 1.31	6.00 ± 1.21	< 0.001	HS
PEFR (L/S)	7.22 ±1.78	8.74 ± 1.09	< 0.001	HS
MEF 75(L/S)	6.42 ±1.94	8.26 ±1.28	< 0.001	HS
MEF 50(L/S)	5.42 ± 1.45	6.38 ± 1.20	< 0.01	S
MEF 25(L/S)	3.44 ± 1.17	4.35 ± 1.14	< 0.01	S

NS = Not Significant , S= Significant P< 0.01 , HS= Highly significant P< 0.001, Degree of freedom =58.

DISCUSSION

Considerable information can be obtained by studying the exercise response of dynamic lung functions in untrained and trained subjects.

Intra group comparison is helpful in noting the exercise response and inter-group comparison in evaluating adaptations of the respiratory system to training.

On comparing the anthropometric data of the two study groups it is clear that the age & sex matched subjects have no statistically significant difference in height, weight & BMI taking a p- value of <0.01 as significant.

VO2 max values were higher in athletes and was statistically significant (P< 0.001).This observation is expected in view of the training stimulus and adaptability of both the pulmonary system and the cardio vascular system. VO2 max is an objective index of the functional capacity of the body's ability to generate power.

Forced vital capacity (FVC) is the volume expired with the greatest force and speed from TLC and FEV1 that expired in the 1st second during the same maneuver. The FEV1 was initially used as an indirect method of estimating its predecessor as the principal pulmonary function test, the maximal breathing capacity.5

On comparing the response of exercise within the two study groups and in between them, there is no statistically significant difference in FVC & FEV1 under any condition.

A normal FEV1/FVC ratio is observed always.

Another way of looking at forced expiration is to measure both expiratory flow and the volume expired. The maximum flow obtained can be measured from a flow –volume curve is the peak expiratory flow rate (PEFR). The peak flow occurs at high lung volumes and is effort dependent. Flow at lower lung volumes is effort independent. Flow at lower lung volumes depends on the elastic recoil pressure of the lungs and the resistance of the airways upstream or distal to the point at which dynamic compression occurs. Measurements of flow at low lung volumes, mid expiratory flow [MEF 25% to 75%] are often used as indices of peripheral or small airways resistance.[5]

On examining Table 2 & Table 3 it is clear that exercise per se does not cause a statistically significant change in dynamic lung function parameters MMEF, PEFR, MEF 25% to 75% in either of the groups. This finding supports the hypothesis that the respiratory system is not normally the most limiting factor in the delivery of oxygen.

On comparing dynamic lung functions in terms of the above flow rates of non-athletes & athletes before exercise [Table 4] it is seen that athletes have higher MMEF, PEFR, MEF 25% TO 75%. This suggests a higher adaptability of the respiratory system to the training stimulus.

These changes are consistently maintained after maximal exercise testing suggesting a higher elastic recoil pressure of the lungs and a lower resistance of medium to small airways in response to exercise as a result of adaptive mechanisms in the pulmonary system.

Ethical Clearance- Taken from institutional ethical committee

Source of Funding- Self

Conflict of Interest - Nil

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Assessment of Lung Functions in Traffic Policemen Occupationally Exposed to Vehicular Emission in Delhi

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ABSTRACT

Background and Aim: Traffic policemen in Delhi are exposed to severe vehicular pollution particularly at traffic signals. Various pollutants and particulate matter from vehicular emission do affect respiratory system. To evaluate the effects of these pollutants, lung function parameters were assessed in traffic policemen and were compared with the controls in Delhi city.

Method: Sixty subjects all non-smokers and males between 30-50 years of age were included, 30 were traffic policemen (exposed group) and 30 controls(non-exposed). Recording of their lung function parameters was done using Spirometer (Spiro-232, PK Morgan) along with anthropometric parameters**.** Lung function test results were compared by applying student t test.

Results and Conclusion: Assessed values of FVC, FEV_1, FEV_1/FVC, PEFR, FEF_{25}, FEF_{50}, $FEF_{75,}$ MVV and lung compliance (Kst) were significantly lower in traffic policemen as compared to control group subjects, suggesting deranged lung functions in exposed groups. The poor lung functions values in exposed group may be attributed to occupational exposure to vehicular emission.

Keywords: *Delhi, lung function tests, particulate matter, traffic policemen, vehicular emission.*

INTRODUCTION

Delhi is one of the highly polluted city in India and huge number of vehicles contributing enormous pollutants that can have adverse effects on respiratory, cardiovascular and nervous system.[1-5] Air quality in Delhi has been deteriorated by release of poisonous gases such as $SO_{2,}$ NO_2, suspended particulate matter (SPM), respirable suspended particulate matter (RSPM), lead, carbon monoxide etc. which are present in excess of the recommended levels.[4] Majority of these pollutants, mainly contributed by two wheelers and passenger cars which have increased in number during the decade 2000–2010.[6] Epidemiological studies have found a significant positive co-relation between environmental pollution and decreased lung functions alongwith respiratory morbidity.[7] Previous studies on exposed population e.g. traffic policemen,[8-13] professional drivers and mechanics[14] have suggested a high prevalence of respiratory symptoms, decreased pulmonary function test results and increased morbidity than in non-exposed population. Gupta et al reported impaired lung functions in rubber factory workers exposed to benzo(a)pyrene[15] and polynuclear aromatic hydrocarbons.[16] Report have shown higher blood lead levels among highway workers.[17] Chronic exposure to vehicular pollution is associated with airway inflammation and particulate component of diesel exhaust particles (DEP) play an important role in this response.[18] This inflammatory response by DEP was not due to NO, as NO_2 alone did not show any cellular inflammatory response in the airways. [19]

Pulmonary function tests serves as the non invasive tool of knowing the functional status of the respiratory system. We hypothesized that, exposure to enormous

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vehicular emissions in Delhi affect respiratory system which can derange pulmonary functions in traffic policemen in Delhi.

Primary objective of our study was to measure and compare various lung function tests in traffic policemen exposed to vehicular emission at traffic intersections and normal controls living in residential areas in Delhi.

MATERIALS AND METHOD

Material: This study was carried out in 68 subjects in the, department of Physiology, in the year 2003**.** 60 subjects were included for analysis after excluding for error. These subjects were categorised into two groups. Group I included 30 traffic policemen (exposed group) and group II included 30 controls (non-exposed group). Subjects in our study were all non-smokers, males, and age matched. Those subjects with any history of smoking, acute or chronic respiratory disorders, chronic heart failure, major congenital anomaly were excluded from the study. Traffic policemen who were posted at various busy traffic intersections (e.g. ISBT, ITO, etc.) in Delhi with a minimum exposure of 5 years were included in the study and controls were taken from our medical college and hospital (security staff and other staff) who were residing nearby. These subjects were instructed to come empty stomach for recording of their PFTs..

This research study was approved by research and human ethics committee of the institute and written consent was obtained from all the subjects after thoroughly explaining them about the study.

METHOD

A comprehensive modified questionnaire based on American Thoracic Society (ATS-DLD-78 questionnaire) was used to get the information regarding duration of job, hours of exposure along with any history of current or past respiratory or other medical illness . Anthropometric parameters like height weight and BMI were also measured in each subject.

MEASUREMENT PROTOCOL

Lung function tests were recorded using computerized Spiro-232 of PK Morgan which is a very sensitive instrument for measuring the pulmonary functions and provide a detailed analysis of measured and derived values and while recording subjects were seated comfortably in an upright position. Adequate demonstration for recording of PFTs was given to the subject till he has comprehended all the instructions well. Spirometer (Spiro-232 of PK Morgan) used in the study is a volume device (dry rolling type) and subject was connected to the spirometer through a collapsible PVC tube and a mouth piece, which can easily be detached and sterilized to ensure proper hygiene .Subject was asked to breathe in order to familiarize himself with the equipment. The nose clip was applied to prevent passage of air through nostrils.

To measure the pulmonary functions, test module was activated and end point of the test was assessed by the shape and the size of the flow volume curve. A total of 3 tests were carried out and the best of the three fulfilling the criteria of reproducibility and validity was considered for analysis.

Lung functions recorded in each subject for analysis:

FVC(Forced vital capacity),FEV_1(Forced Expiratory Volume in 1st second of forceful expiration),FEV_1/FVC% (ratio of FEV_1 to FVC), FEF_{25-75} (Forced Expiratory Flow during 25-75% of expiration),PEFR (Peak Expiratory Flow rate),MVV(Maximum Voluntary Ventilation),Raw(Airway Resistance). KST(lung compliance),

IC(Inspiratory Capacity), ERV(Expiratory Reserve Volume), IRV(Inspiratory Reserve Volume),FRC (Functional Residual Capacity), RV(Residual Volume), TLC(Total Lung Capacity), RV/TLC%,SVC (Slow Vital Capacity) and TV.

The data recorded from 60 subjects was statistically analysed. Tabulation and computation of various statistical measures like mean, standard deviation and analysis of variance was done. Student t test was done to compare pulmonary function tests among traffic policemen and controls. P-value of <0.05 was considered as significant.

RESULTS

Anthropometeric measurement: Mean age, height, weight and body surface area in traffic policemen and controls are shown in Table I. Anthropometric parameters in both the groups included in our study indicate homogeneity with slightly higher values in

traffic policemen .

Lung functions Tests: Mean values of PFTs measured in traffic policemen and normal controls are depicted in Table II and III. The PFTs results were poor in traffic policemen as compared to control .

Values of FVC, FEV_1, FEV_1/FVC, PEFR, FEF_{25}, FEF_{50}, $FEF_{75,}$ (Table II), MVV,(Table III) were significantly lower in traffic policemen as compared to control group subjects .

The results higher values of RV (residual volume), RV/TLC and lower value of TLC (Table III) in traffic policemen as compare to normal controls reflects poor lung functions in the traffic policemen.

Significantly higher values of airway resistance (Raw) and and lower values of lung compliance (KST) were observed in traffic policemen) as compare to normal controls (Table IV).

Levels of air pollution:

Table- V shows mean annual levels of pollutants in Delhi, in the year 2003 (study year). Values of these pollutant levels were obtained from the data published by Central Pollution Control Board(CPCB).[4] It shows that levels of SPM, RSPM, SO2, benzo(a)pyerene, polycyclic aromatic hydrocarbons (PAH) are much higher at traffic intersection than the residential areas

DISCUSSION

Data from experimental researches in humans have shown that exposure to oxidant air pollutants may cause injury and inflammation to the airways.[20,21] However, from controlled exposure studies and occasional care reports, the nasal cavity also appear to be the target of injury from the oxidant gases in air pollution.[20,22] Hence exposure to air pollutants does affect respiratory system and its functions.

Study on Bangkok traffic policemen have shown statistically significant lower FEV_1 and FVC than the general population.[8] Our study has also shown that FEV_1 and FVC are significantly lower in traffic policemen. A study done in Pondicherry on traffic policemen revealed significantly reduced VC, FEV_1, PEFR, FEF_{25}, FEF_{50}, $FEF_{75,}$ MVV [13] and these results are similar as seen in our study.

Amongst all lung function tests the FEV_1 is not only simple maneuver to measure but has dependable reproducibility[23] and therefore most widely used and quoted lung function test in clinical practice. Chronically reduced FEV_1 is a predictor of increased risk of mortality and is considered to be an adverse respiratory health effect of air pollution.[24]

In present study, on intergroup comparison FEV_1/FVC% is significantly lower in traffic policemen than controls. Lower results of FVC indicate airflow limitations and attributed to dynamic compression of airways and associated air trapping .The FEV_1/FVC% is a better and more meaningful variable as it is susceptible to impairment and depend on the characteristics of the lung and airways.[25] This significantly lower value of FEV1, FEV_1/FVC% and higher value of RV and RV/TLC% among traffic policemen suggest an obstructive pattern of lung functions in traffic policemen and this is further authenticated by higher values of airway resistance (Raw) in them. Lower values of VC and chest expansion as reported in our study was also seen in Thai traffic policemen.[26] Flow rates i.e.PEFR, FEF_{25}, FEF_{50}, FEF_{75} were significantly lower in traffic policemen and can be explained by significantly higher values of airflow resistance (Raw) in them.

MVV and compliance(Kst) values were significantly lower in traffic policemen suggesting less efficient functioning of respiratory system. Impaired lung function are reported in the factory workers exposed to Benzo(A)pyrene[15] and polynuclear aromatic hydrocarbons,[16] compounds also present as air pollutants and results of our study are on similar pattern.

The present study supports the findings observed in the similar previous studies[7-13] and suggests that compromised lung function parameters in traffic policemen may be due to the occupational exposure to immense vehicular emissions.

$PM_{2.5}$ is the most dangerous particulate fraction among various pollutants which affects lung functions.[27] Fine particulates ($PM_{2.5}$) are ubiquitous because they are largely derived from combustion processes such as engines of motor vehicles and they may be an important public health concern as these can be breathed deeply into the lungs, various substances i.e. sulfates, nitrates, acids, metals, and carbon particles with various chemicals adsorbed onto their surfaces.[28] Chronic exposure to vehicular pollution is associated with airway

inflammation and the particulate component of diesel exhaust is responsible for the action.[18] High levels of various pollutants inhaled at busy traffic intersections as shown in our study seem to be the primary pollutants responsible for deranged pulmonary functions in traffic policemen in Delhi.

LIMITATION OF STUDY

We could not measure the level of pollutant emission at traffic intersections and residential areas, Inflammatory markers (IL-6 ,TNF-α etc.) and levels of pollutants in blood because of resource crunch and were mainly dependent on the reliable data that we had from CPCB sources.

Table I: Comparison of anthropometric variables in traffic policemen and normal control

S. No.	Variable	Normal controls (Group II)	Traffic Policemen (Group I)
1.	Age (yr)	36.07±4.49	36.09±5.09
2.	Height (cm)	174.73±4.49	178.56±3.26
3.	Weight (kg)	69.63±8.85	70.78±8.20
4.	BSA (m_2)	1.83±0.13	1.88±0.10

Values are mean±SD

Table II: Comparison of flow rates in traffic policemen and control group

S. No.	Variable	Normal controls (Group II)	Traffic Policemen (Group I)
1.	FVC (L)	4.61±0.69	4.15±0.90*
2.	FEV_1 (L)	4.41±0.65	3.65±0.70****
3.	FEV_1/FVC (%)	95.50±3.05	88.67±8.36****
4.	PEFR (L/sec)	11.33±1.60	8.13±2.09****
5.	FEF_{25} (L/sec)	10.31±1.44	7.39±2.07****
6.	FEF_{50} (L/sec)	7.12±1.03	5.57±1.45****
7.	FEF_{75} (L/sec)	4.47±0.82	2.97±1.01****

Values are mean±SD , *p<0.05, ****p<0.0001

Table III: Comparison of lung volume and capacities in traffic policemen and control group.

S. No.	Variable	Normal controls (Group II)	Traffic Policemen (Group I)
1.	IC (L)	3.40±0.51	3.15±0.89
2.	ERV (L)	1.68±0.45	1.24±0.52***
3.	FRC (L)	2.61±0.82	2.47±1.08
4.	RV (L)	0.94±0.31	1.13±0.84
5.	TLC (L)	5.92±1.08	5.35±1.59
6.	RV/TLC (%)	15.82±3.66	20.06±7.83**
7.	IRV (L)	2.45±0.47	2.12±0.71*
8.	SVC (L)	4.96±0.76	4.42±0.94*
9.	MVV (L/min)	159.97±12.25	120.40±28.20****

mean±SD , *p<0.05, **p<0.01, ***p<0.001, ****p<0.0001

Table IV: Comparison of lung mechanics in traffic policemen and control group.

S. No.	Variable	Normal controls (Group II)	Traffic Policemen (Group I)
1.	RAW (L/ cm of H_2O)	1.82±0.47	2.37±0.83**
2.	KST(cm of H_2O/L/Sec)	0.16±0.06	0.08±0.02****

mean±SD , **p<0.01, ****p<0.0001

Table V: Annual mean levels of pollutants in residential areas and traffic intersection in Delhi*

Pollutant	Year	Annual mean Conc. in residential area	Annual mean Conc. at traffic intersection (ITO)
SPM(µg/m3) Suspended particulate matter	2003	346	509
RSPM(µg/m3)- Respirable Suspended Particulate Matter	2003	144	244
NO_2(µg/m3)	2003	43	94
SO_2(µg/m3)	2003	10	09
PAH(ng/m3)- Polycyclic Aromatic Hydrocarbons	Dec.-Jan2004- 2005	23.8	54.4
SPM laden-Benzo(a)pyrene(ng/m3)	Dec.-Jan2004- 2005	2.77	7.31

*source CPCB[4]

CONCLUSION

In our study significantly lower values of FVC, FEV_1, FEV_1/FVC, PEFR, FEF_{25}, FEF_{50}, $FEF_{75,}$ MVV, compliance (KST) seen in traffic policemen clearly indicate obstructive pattern of lung function. Since exposure to emission caused by the vehicles is the only variable in the two groups, in conclusion we may state that data reported by us has shown that exposure to immense vehicular emission compromise respiratory function parameters in traffic policemen. These harmful effects can be reduced by using good quality protective masks, using advanced systems for traffic signals and management to minimize manned traffic control, regulatory measures at the Government level to control the vehicles density and strict emission norms along with improving of city infrastructure to decongest the city.

Conflicts of Interest- None

Source of Funding- Self

Ethical Clearance- Obtained from Institutional research and ethics committee

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Study of Examination Related Anxiety Levels in First Year Medical Students

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ABSTRACT

Study of examination related anxiety levels in first year medical students during university examination

Background & objective: Undergraduate medical education comprises strenuous study and training for a period of 5–6 years, which might adversely affect students' mental health. Medical school is recognized as a stressful environment that often has a negative effect on students' academic performance, physical health, and psychosocial well-being. Hence the current study was designed to assess examination related anxiety among first year medical students during university examination.

Materials & method: Ninety healthy first year medical students of both the sex in the age group of 18-19 years were included for the study. Informed consent & IEC was obtained. Anxiety levels were measured by administering the Hamilton Anxiety Rating Scale (HAM-A) questionnaire.

Results: The anxiety scores were significantly higher in female students (12.49 ± 6.42) than in male students (9.49 ± 5.06) ($p<0.05$). Results of our study showed 86.7% of students with mild, 8.9% of students with moderate and 4.4% of students with severe degree anxiety during examinations.

Conclusion: The results suggest that there was significant increase anxiety level among the first year medical students, especially females during university examination. Effective lifestyle modifications, stress management and counseling should be implemented as the students enter the professional schools.

Keywords: *Anxiety levels, Medical students, Medical Education, HAM-A, Stress.*

INTRODUCTION

Mental health is an essential component of health defined by the World Health Organization. Undergr aduate medical education comprises strenuous study and training for a period of 5–6 years, which might adversely affect students' mental health. Medical school is recognized as a stressful environment that often has a negative effect on students' academic performance, physical health, and psychosocial well-being. The curricular objectives are dynamic due to expanding knowledge and evolving therapies. Medical students experience higher levels of depression and anxiety compared to the general population and to their same age peers.[1,2]

Anxiety and depression are worldwide problems which reflect the mental health of the population. The American Psychological Association characterizes anxiety and stress by feelings of tension, worried thoughts, and physical changes.[3,4] Anxiety is more related to autonomic arousal, skeletal muscle tension, and situational aspects, whereas stress is more related to irritability, impatience, and difficulty in relaxing. Stress has been found to correlate with depression and anxiety.[5]

Anxiety is defined as an abnormal and overwhelming sense of apprehension and fear often marked by physiological signs (as sweating, tension, and increased pulse), by doubt concerning the reality and nature of the

threat, and by self-doubt about one's capacity to cope with it.[6] Increase in levels of anxiety and depression will have a negative impact on proficiency of academic study program, which ultimately affect the society economically. In addition patients care is affected by psychological distress among physicians such as poor communication, diminished quality of care and medical errors have been found to be associated with physical stress.[7,8]

The rapid increase in the number of medical schools makes interesting field for exploring a range of issues related to medical education. Evaluation is a part of academic curriculum. These are often tiresome and extremely stressful for students at any level of education. Stressful feelings can alter the ability to think during examinations. Hence the current study was designed to study examination related anxiety in first year medical students during university examinations.

MATERIALS & METHOD

This cross sectional study was conducted in the department of Physiology, Koppal Institute of Medical Sciences, Koppal, Karnataka, India. The study involved ninety healthy first year medical students in the age group of 18-19 years. Informed consent was taken from all the participants who volunteered for the study. The study was approved by Institutional Ethical Committee, Koppal Institute of Medical Sciences, Koppal, Karnataka, India.

Inclusion criteria:

1. Ninety healthy first year medical students of both sex between 18 and 19 years.

Exclusion criteria:

1. History of consumption of alcohol/smoking.
2. History of depressive disorders in the past.
3. History of sleep disorders.
4. History of any major medical illness.
5. History of consumption of drugs acting on CNS.

Study design: The subjects were selected by a detailed history & thorough physical examination. The students were asked to fill the questionnaire after their theory exams and before the practical exams. Anxiety levels of the students were determined by Hamilton Anxiety Rating Scale (HAM-A) questionnaire.[9] HAM-A was one of the first rating scales developed to measure the severity of anxiety symptoms and is widely used both for clinical as well as research settings. Questionnaire consisted of 14 items measures both psychic anxiety (mental agitation and psychological distress) and somatic anxiety (physical complaints related to anxiety). We administered the questionnaire as a hard copy. Each item is scored on a scale of 0 (not present) to 4 (severe), with a total score range of 0-56, where <17 indicates mild, 18-24 mild to moderate, 25-30 moderate to severe.

STATISTICAL ANALYSIS

The results were expressed as mean ± standard deviation (SD). A p value of <0.05 was considered statistically significant. Statistical analysis was performed using the statistical package for social & sciences. Chi square test was applied to compare between the parameters.

RESULTS

Anxiety levels of the students were determined by Hamilton Anxiety Rating Scale (HAM-A) questionnaire in forty five healthy male (18.58 ± 0.49) years & forty five female medical students (18.53 ± 0.50) years in the age group of 18-19 years. The anxiety scores were significantly higher in female students (12.49 ± 6.42) than in male students (9.49 ± 5.06) ($p<0.05$) Table 1 & figure 1. Results of our study showed 86.7% of students with mild, 8.9% of students with moderate and 4.4% of students with severe degree anxiety during examinations. The results are shown in the table 2 & figure 2.

DISCUSSION

Anxiety is a normal reaction to stress. Stress is defined as any change in the environment those changes or threatens to change an existing optimal steady state.[10] Anxiety and depression can be taken as a reliable indicator for assessment of mental illness in the community.[11] In our study, 86.7% of subjects showed mild anxiety levels, 8.9% of subjects showed moderate anxiety levels and 4.4% of subjects showed severe anxiety levels. A significant relationship, however, was found in the present study between gender and anxiety where female students experienced anxiety than male

students. The higher anxiety scores in female medical students could be due to hormonal changes.

Many Psychological factors contribute significantly to examination related anxiety. Various stressors, such as financial, workload, academic pressure, inadequate teacher and student relationships, parent and child relationships, family problems, peer relationships, physical illness, emotional problems, and worries about the future, contribute to poor mental health in some if not all medical students.[12-14] Academic stress, inability to cope up difficulties, and lack of concentration are the major stressors found among medical students.[5,12] Lack of strategic studying, time management, inconsistent content coverage, inappropriate learning styles, lack of review & revising the content studied are the major factors leading to examination related anxiety.

Medical students undergo psychological, hormonal, immunological and behavioral changes during the pre-examination time. The extents to which these changes take place in different students depend upon gender, physical activity, spiritual strength etc.[15] The reason that first year students undergo anxiety could be related to the transition from secondary school to university, academic overload, homesickness, unfamiliarity with academic procedures and demands, time management, the process of making new friends, and increased expectations from family and faculty.

The previous literature reveals that medical students attending private medical schools exhibit more depression than students attending public medical schools. This trend may be due to additional pressures placed on students due to high expectations from parents who have made a financial investment on their child's private medical education.

Table:1 Percentage of anxiety scores in first year medical students.

Anxiety scores	Frequency	Percentage
Mild	78	86.7
Moderate	8	8.9
Severe	4	4.4

Table: 2 Percentage & Gender based Hamilton Anxiety Rating Score of the students

Anxiety scores	Male n/ %	Female n/ %	Total n/ %
Mild	42 53.8%	36 46.2%	78 100%
Moderate	3 37.5%	5 62.5%	8 100%
Severe	0 0.0%	4 100.0%	4 100%

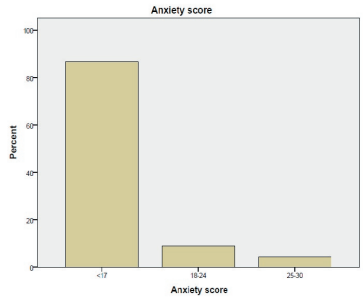

Figure 1: Shows Percentage of anxiety scores in first year medical students

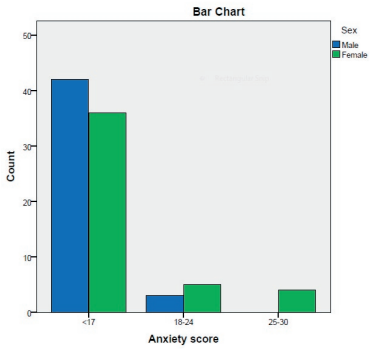

Figure 2: Shows anxiety scores in male & female students

CONCLUSION

Our study concludes mild anxiety due to examination among the first year medical students which overall deteriorates the performance of the students. Anxiety scores were higher in female students as compared to male students. Effective lifestyle modifications, stress management and counseling should be implemented as the students enter the professional schools.

Scope of the Study: Further study can be extended in all the phases of medical education & with the estimation of hormones.

Source of Support: Nil

Conflict of Interest: The authors declare no conflict of interests.

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Assessment of Emotional Intelligence in First Year Medical Graduates - A Questionnaire based Study

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ABSTRACT

Aim : To assess emotional intelligence in first year medical graduates

Introduction : Emotional intelligence depicts how to manage behaviour, navigate social complexities, and make personal decisions that achieve positive results. Emotional intelligence is made up of four core skills that pair up under two primary competencies: personal competence and social competence.

Materials and Method: After obtaining informed consent, EI score of 135 medical graduates were assessed using Schutte et al questionarre.

Results. In our study, mean EI score for male is 93 whereas for female it was 135. On comparing the EI scores for males and female using unpaired T test, P value was found to be highly significant (P = 0.00888**). This study concludes that females have more emotional intelligence than males.

Keywords : *Emotional intelligence, Schutte questionarre, Likert scale)*

INTRODUCTION

Emotional Intelligence (EQ or EI) is a term created by two researchers – Peter Salovey and John Mayer – and popularized by Daniel Goleman in his 1996 book of the same name. Emotional intelligence (EI) is one element in a broad spectrum of skills that enables an individual to create value for oneself and others. Emotional intelligence includes the ability to

(a) perceive emotions

(b) use emotions to facilitate thought

(c) understand emotional information

(d) regulate emotions[1]

The five components of emotional intelligence designed by Daniel Goleman includes

- Self-awareness: emotional intelligence enhances a person's understanding of their own emotions
- Self-regulation: controlling one's own internal states
- Interpersonal Social Skills: maintaining relationships with others
- Empathy: sharing and recognizing emotions of others
- Motivation

Assessment of emotional intelligence is an important factor in determining students' adjustment and educational achievements. Attending college is a life-changing experience. The first year in college presents wonderful opportunities to know different academic disciplines. But since college is very different from high school, students may experience a lot of changes that can lead to problems. It is believed that emotional intelligence may explain differences in the quality of intrapersonal and interpersonal relationships and contribute to job performance and management effectiveness and predict success.

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METHODOLOGY

After obtaining informed consent, 135 first year medical graduates were chosen for the study, out of which 45 were males and 90 were females. Their emotional intelligence was assessed using EI scale developed by Schutte et al. It includes the following 33 questions.

1. I know when to speak about my personal problems to others.
2. When I am faced with obstacles, I remember times I faced similar obstacles and overcame them.
3. I expect that I will do well on most things I try.
4. Other people find it easy to confide in me.
5. I find it hard to understand the nonverbal messages of other people.
6. Some of the major events of my life have led me to re-evaluate what is important and not important.
7. When my mood changes, I see new possibilities.
8. Emotions are some of the things that make my life worth living.
9. I am aware of my emotions as I experience them.
10. I expect good things to happen.
11. I like to share my emotions with others.
12. When I experience a positive emotion, I know how to make it last.
13. I arrange events others enjoy.
14. I seek out activities that make me happy.
15. I am aware of the nonverbal messages I send to others.
16. I present myself in a way that makes a good impression on others.
17. When I am in a positive mood, solving problems is easy for me.
18. By looking at their facial expressions, I recognize the emotions people are experiencing.
19. I know why my emotions change.
20. When I am in a positive mood, I am able to come up with new ideas.
21. I have control over my emotions.
22. I easily recognize my emotions as I experience them.
23. I motivate myself by imagining a good outcome to tasks I take on.
24. I compliment others when they have done something well.
25. I am aware of the nonverbal messages other people send.
26. When another person tells me about an important event in his or her life, I almost feel as though I have experienced this event myself.
27. When I feel a change in emotions, I tend to come up with new ideas.
28. When I am faced with a challenge, I give up because I believe I will fail.
29. I know what other people are feeling just by looking at them.
30. I help other people feel better when they are down.
31. I use good moods to help myself keep trying in the face of obstacles.
32. I can tell how people are feeling by listening to the tone of their voice.
33. It is difficult for me to understand why people feel the way they do.

The participants were instructed to rate the extent they agree or disagree with each statement on a five-point Likert scale.

1 = strongly disagree

2 = disagree

3 = neither disagree nor agree

4 = agree

5 = strongly agree

The final score was calculated by summing their responses. The data obtained was statistically analyzed.

RESULTS

The maximum and minimum total scores are 165 and 33 respectively. The statistical analysis was done using unpaired T test

MALE EI SCORE (n=45) Mean ± SD	FEMALE EI SCORE (n=90) Mean ± SD	P VALUE
93 ± 14.31	135 ± 9.983	0 .00888**

In our study, mean & SD for male EI is 93 ± 14.31 whereas for female it was 135 ± 9.983. On comparing the EI scores for males and female using unpaired T test, P value found to be highly significant (P = 0.00888**). This study showed that females have more emotional intelligence scores than males.

DISCUSSION

It is believed that emotional intelligence plays a very important role in leadership, work life and career development. Intelligent quotient (IQ) predicts only about 20 percent of career successes, which leave the remaining 80 percent to other factors one among being emotional intelligence[2]. In our study females were found to have high EI score than males. This finding was supported by study done by Kemp AH et al.[3]

EI was associated more with personality than with cognitive ability, EEG was found to explain a significant portion of the variance in EI scores. The finding that low EI is related to underarousal of the left-frontal cortex (increased theta EEG) is consistent with research on patients with depression, as well as attention deficit hyperactivity disorder .

In another study done by Aditya Gupta et al there was no significant difference between males and females for emotional intelligence and also stated that as emotional intelligence increases ,the level of perceived stress decreases[4]

CONCLUSION

Emotional intelligence taps into a fundamental element of human behavior that is distinct from your intellect. Low EI may hinder the academic success and adjustment throughout the medical training If sufficient measures were taken to improve EI, are provided in the beginning of the medical curriculum it would make students more stress free during their training years at medical college[5].

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Taken

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Study of Relation between Type 2 Diabetes Mellitus and Blood Groups

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ABSTRACT

Aims and Objectives:- To study ABO blood group and Rh system distribution among type 2 Diabetics compared to controls

Method: A cross sectional study was conducted on 100 cases of type2 diabetes mellitus in the age group of 35-70years attending HIMS for follow up after taking prior written informed consent. study subjects blood samples was subjected for blood grouping and Rh typing (Haemagglutination technique). Data were expressed in terms of absolute number of frequency and percentage, Chi square test applied to determine whether any significant association between blood groups and diabetes. A p value less than 0.05 was considered as statistically significant.

Results: The study shows higher percentage of blood group B in the diabetic group(39%) as compared to controls(20%) p value is 0.005. There is also a positive association between Rh positive blood group and Diabetes.

Conclusion: Blood B was associated with increased risk of Type2 diabetes.

***Keywords**: Blood group, diabetes mellitus.*

INTRODUCTION

Ever since the discovery of blood groups in 1900, there have been efforts to discover a possible association between ABO and Rh blood groups and different diseases. The data obtained from the studies conducted on patients with gastric cancer, salivary gland tumors, duodenal ulcer, colorectal cancer, thyroid disorders, ovarian tumors, small cell carcinoma of lungs and coronary heart diseases have shown association with ABO blood groups[1-5]. This information has led to assumption that some other diseases might also be associated with ABO and Rh blood groups. Such associations may have significance to identify susceptibility to diseases and to adopt possible preventive measures to decrease the prevalence.

Diabetes mellitus is a common medical problem having significant morbidity and mortality. The number of people with diabetes in India currently around 40.9million is expected to rise to 69.9million by 2025[6]. The term diabetes describes metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbance in carbohydrate, protein and lipid metabolism resulting from defect in insulin secretion, insulin action or both. Type II diabetes noninsulin dependant diabetes mellitus includes common major form of diabetes results from insulin resistance[7]. The major human blood group system ABO, they are normally classified as A,B,AB,O depending on the presence or absence of the two agglutinogens A and B[8].Since their discovery by Landsteiner in 1900[9], many researchers have made attempts to determine the significance of particular ABO phenotype for susceptibity to diseases. certain diseases shows strong a strong association with ABO blood groups, notably peptic ulcer

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is much higher in blood group 'O' [10], where as cancer of stomach ,tumors of salivary glands are more frequent in blood group `A' individuals. Like many other inherited traits, blood groups and also genetically predetermined and therefore may have an association with diabetes mellitus. Identification of a positive association with blood group might reflect increased susceptibility and a negative association protection against diabetes mellitus. Investigations in different countries showed varying finding regarding the susceptible of blood group as a risk factor for DM in different population. Since DM has serious complications of various organs kidney, neuron, eye, heart etc., the current study was carried out to find the association between different ABO blood groups and DM.

MATERIALS AND METHOD

This cross sectional, observational study was carried out on 100 type2 diabetic patients and 100 controls. Study was conducted on all the patients diagnosed with type2 diabetes mellitus under treatment and came for follow up. Patients were taken from outpatient and inpatient of department of general medicine of shree Chamarajendra hospital Hassan institute of medical sciences. Healthy non diabetic volunteers working at Hassan institute of medical sciences as controls. The subjects who were not willing for the study, history of any other medical and surgical complications and drug usage were excluded from the study. The study protocol was approved by the institutional ethics committee. The risk and benefits of the study explained to all the subjects and informed written consent was obtained from all the subjects. After taking relevant past, personal history and thorough clinical examination of each subject, the information was recorded in a data schedule. A drop of blood was taken from their finger tip using lancet, under aseptic precautions. 1 drop of the blood was mixed with one ml of normal saline in a test tube this provides red cell suspension. The blood group was determined by Slide haemagglutination technique. A drop of Anti A, Anti B, Anti D was added separately on a clean glass slide and to each of this a drop of red cell suspension was added . With separate applicator, serum well mixed back and forth and observed for agglutination and confirmed by low power objective. Results recorded immediately for ABO blood group and after 2 min for Rh. The data collected were expressed as absolute number of frequency and percentage. Chi square test applied to determine whether any significant association between blood groups and diabetes. A p value less than 0.05 was considered as statistically significant

RESULTS

The table-1 shows more number of diabetics were in the age group of 50-59 years. The table-2 shows the distribution of blood groups in diabetics in the order of B>A>O>AB. The results shows significant difference between healthy controls and diabetics in the blood group B. The Occurrence of diabetes was significantly more in individuals with blood group B. The table-3 shows significant difference between the diabetic subjects and controls in Rh positive(p=0.04).

Table-1 Distribution of the subjects according to age groups for diabetes and control group.

Age group	Diabetes group	Control group
30-39	10	24
40-49	28	47
50-59	45	29
60-69	15	0
>=70	2	0

Table-2 Comparison of ABO blood groups between diabetes and control group

Blood group	Diabetes group (%)	Control group (%)	X^2 value	p-value
A	30	35	0.36	0.54
B	39	20	7.789	0.005
AB	5	9	0.69	0.41
O	26	36	1.89	0.16

Table-3 Comparison of Rh system between diabetes and control group

Rh system	Diabetes group (%)	Control group (%)	X^2 value	p-value
Rh+	**100**	**94**	4.29	0.04
Rh-	6	6		

DISCUSSION

Many investigators have tried to identify a possible association between ABO & Rh blood groups and diabetes mellitus. The results have been variable, inconsistent and differed from one region to other. Some people have identified an association between blood groups and diabetes but there are studies where no association could be established. Results of this study indicate that individuals with blood group B are more likely to have Diabetes Mellitus. Blood group Rh positive is more frequent in diabetics when compared to healthy controls.

In Trinidad, Henry and Poon- King found increased frequency of blood group B in diabetics. The results are similar to our study.[13] Dali et al made similar observations in a recent study conducted in Algerian population.[14] In contrast, some studies have shown positive association of blood group A and diabetes i.e. increased frequency of blood group A in diabetics.[15] In Tokyo Naoto Egawa *et al.* found that compared with the non-DM group, the DM group had a higher frequency of blood group B [16]. It is similar to the observation of Joseph A. [17]We have found an increased frequency of Rh positive blood group in diabetic groups compared to control group. Many research studies have been established equal distribution of ABO blood groups among diabetics and non-diabetics. Macafee[18] investigated an association between ABO blood groups and Diabetes Mellitus. Based on his observation the results suggested similar distribution of different blood groups in Diabetics and healthy subjects. Koley[19] also confirmed that there was no significant difference of ABO blood groups in diabetics and healthy subjects. Similar findings have been made by Sidhu et al.[20] and Qureshi and Bhatti[21].

The possible explanation of these conflicting findings is that probably racial and geographical factors have a role in genetic expression of disease. Moreover most of the studies conducted in this regards have small sample size. Probably studies on larger scale and a meta analysis of work done so far will provide a solution to this dilemma

CONCLUSION

The study shows a higher percentage of blood group B in the diabetic group as compared to controls. There is also a positive association between Rh positive blood groups and Diabetes.

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Conflict of Interest-Nil

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Assessment of Cognition and Psychomotor Skills in Anaemic Patients

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ABSTRACT

Introduction:- Anaemia is a common haematological syndrome, which is more prevalent in developing countries like India.. It is characterized by deficiency of Haemoglobin in the blood, which can be caused by either too few Red blood cells or too little Haemoglobin in the cells. Haemoglobin content in the blood determines the quality of blood and quality of blood determines the functioning of different organs of the body and brain is not an exception. Therefore this study has been undertaken to assess the cognition and psychomotor skills in Anaemic patients.

Aims & Objectives :- 1. To assess the cognition and psychomotor skills in Anaemic patients.

2. To know which of the two is affected more in Anaemia.

Materials & Method:- The study was conducted on 60 subjects of both genders with mean age of 31.9 years. Anaemia was established in all the subjects by estimation of Haemoglobin content by cyanmethaemoglobin method (spectrophotometric method). Cognition & Psychomotor skills were assessed in test group (Anaemic patients) & control group (Non – anaemic subjects) by : 1. Modified 100 Pin dexterity test 2. Determination of Auditory Reaction Time (ART), Visual Reaction Time (VRT) & Critical Flicker Fusion Frequency (CFFF) 3. Mini mental test.

Results : Auditory and Visual reaction time though appear to be with in normal range in both test and control groups Auditory reaction time is significantly prolonged in test group ($p=<0.01$). Critical flicker fusion frequency, Pin dexterity and Mini mental test results show no significant difference between test and control group.

Conclusion: In our study we have found that, Anaemia impairs Cognition & psychomotor skills. The impairment of cognition is initiated by prolongation of Auditory reaction time rather than Visual reaction time. Further studies with larger sample size may be required to establish our findings.

Keywords: *Anaemia – Cognition - Psychomotor skills - Auditory Reaction Time – Visual Reaction Time - Critical Flicker Fusion Frequency.*

INTRODUCTION

Anaemia is a common haematological syndrome which is more prevalent in developing countries like India . The World Health Organisation estimates that world wide 1.6 to 2 billion people are Anaemic.[1] Anaemia means deficiency of Haemoglobinin the blood, which can be caused by either too few Red blood cells or too little Haemoglobin in the cells. It is functionally defined as an insufficient RBC mass to adequately deliver Oxygen to peripheral tissues.[2] Haemoglobin content in the blood determines the quality of blood. Quality of blood determines the functioning of different organs of the body and brain is not an exception. Decreased Haemoglobin levels may lead to decreased attentiveness, low neuronal metabolic activity ,decreased nerve conduction velocity, alteration of neurotransmission systems, hypomyelination of neurons which affect Cognition and psychomotor skills. Therefore this study has been undertaken to assess the

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Cognition and psychomotor skills in Anaemic patients.

AIMS & OBJECTIVES

1. To assess the cognition and psychomotor skills in Anaemic patients.

2. To know which of the two is affected more in Anaemia.

MATERIALS AND METHOD

The study was conducted on 60 subjects out of which 37 subjects were females and 23 subjects were males and their mean age was 31.9 years. Subjects were selected by simple random sampling.In all the subjects Haemoglobin content was estimated by Cyanmethaemoglobin method, which is Spectro photometric method principled on Optical density measurement using Beer Lamberd's law (For this Spectro photometric method -Green filter of wavelength 540 Hz is used). Haemoglobin content of >12g/dL rules out Anaemia and Haemoglobin content < 12g/dL indicates Anaemia .Anaemic patients constitute test group and non- Anaemic subjects constitute control group. Cognition and psychomotor skills were assessed in both groups by :

1. Modified 100 pin dexterity test similar to '0' connor finger dexterity test :-

In this test subject is asked to place one pin of any colour in one hole at a time in an orderly manner for a duration of three minutes and no. of pins placed on the board in three minutes is considered as their score.[3]

2. Determination of Visual Reaction Time & Auditory Reaction Time :

Visual Reaction Time & Auditory Reaction Time were recorded using an in house built device called PC 1000. It has 1000Hz square wave generator & one in two keys, in module A & B with which we can start & stop the oscillator. Module A has start button & module B has the stop button. The visual stimulus is a red colour light which is 5 mm in size (LED – Light emitting diode). In module 'A' when 'start' button is pressed, the red light will glow in module- B, for which the subject has to press 'stop' button in module – B. The no. of Oscillations produced by the oscillator in this period is recorded as reaction time with an accuracy of 1msec. Auditory Reaction Time is also recorded in a similar way. The only difference between ART & VRT is the subject will hear a tone of 1000 Hz in head phones instead of Red colour light in the determination of Auditory Reaction Time.[4]

Determination of CFFF:-

CFFF was measured using an in house built device. This device can lit a Red light emitting diode (5mm) at different frequencies in the range of 10Hz to 60 Hz (Square wave) with the help of a software called as 'Sweepgen'. The subject will be seated in front of the module at near vision distance of 25-30 centimeters in a semi dark room. To begin with the test the Red light is made to flicker at low frequency of 10Hz and the subject is asked to prompt when the flickering stops. Now the frequency is gradually increased in steps of 1Hz. The frequency at which the subject is no longer able to discriminate individual flickers and he starts perceiving it as a single stimulus is recorded & reported as CFFF. We can try the same in the decremental order of frequency to identify at what frequency he perceives the flicker.[5]

Mini mental test:- Test & Control groups are subjected to minimental test with a set of '10' questionnaire as mentioned in the below table. Accordingly scores were assigned to each subject.[6]

Mini mental state examination questionnaire :

1.	Place & Time	-	10 Points
2.	Repeat prompts	-	3 Points
3.	Serial 3s or 7s	-	5 Points
4.	Second registration	-	3 Points
5.	Naming the objects	-	2 Points
6.	Phrase repetition	-	1 Point
7.	Complex commands	-	6 Points
	Total	-	30 Points

In both test and control group the effect of decreased and normal Haemoglobin content, were studied on 100 Pin dexterity test , Mini mental test , Visual Reaction Time, Auditory Reaction Time & CFFF.

RESULTS

Auditory and Visual reaction time though appear to be with in normal range in both test and control groups,

Auditory reaction time is significantly prolonged in test group (p=<0.01). Critical flicker fusion frequency, Pin dexterity and Mini mental test results show no significant difference between test and control group.

Table 1: Table showing anthropometric parameters group wise.

Parameters	Test group	Control group
Age in years.	31.9± 8.7	28.3 ± 7
Weight in Kgs.	154.9 ± 7.8	161.7 ± 10.9
Height in cms.	57.5 ± 8.7	60.1 ± 9.4
BMI	24 ± 3.4	22.9 ± 3.3

Table: 2 Table showing Mean, SD & P values for various parameters

Parameters	Test group	Control group	p - value
ART (milli seconds)	197.5 ± 35	177.1 ± 26.8	p=0.01*
VRT (milli seconds)	229.4 ± 30.3	219.9 ± 25.5	p= 0.41
CFFF (Hz)	39.4 ± 4.2	40.7 ± 4.9	p=0.36
Pin dexterity test (Score out of 100)	64.5 ± 10.7	66.2 ± 9.7	p=0.52
Mini mental test (score out of 30)	27.89 ± 3.12	28.06 ± 2.03	p=0.80

*** p<0.05 –Significant**

DISCUSSION

Anaemia is defined as deficiency of Haemoglobin in the blood which can be caused by either too few Red blood cells or too little Haemoglobin in the cells. Haemoglobin content in the blood determines the quality of blood and quality of blood determines the functioning of different organs of the body, and brain is not an exception . Since Anaemia is not a life threatening emergency this condition has been grossly neglected, but it is a common condition which can be easily treated. Therefore this study has been under taken to study the effect of Anaemia on Cognition and Psycho motor skills.

The study was conducted on 60 subjects of both genders with mean age of 31.9 yrs. Anaemia was established in all the subjects by estimation of Haemoglobin content by cyanmethaemoglobin method (spectrophotometric method). Cognition & Psychomotor skills were assessed in test group (Anaemic patients) & control group (Non – anaemic subjects) by : 1. Modified 100 Pin dexterity test 2. Determination of ART, VRT & CFFF 3. Mini mental test .

In our study we have found a statistically significant prolongation of Auditory Reaction Time in Anaemic patients. (P<0.01). other parameters like Visual Reaction Time , CFFF, Scores of 100 Pin dexterity test and Mini mental test were also decreased in Anaemic patients but they were not statistically significant.

Anaemia is associated with alteration in many metabolic processes that may impact brain functioning (eg. Mitochondrial electron transport, neurotransmitter synthesis and degradation, protein synthesis and organogenesis).[7] In Anaemic patients, structural and functional changes in central nervous system, Impaired Dopamine metabolism (ie,. Process of attention to environmental information is dependent on rates of Dopamine clearance from the interstitial space and Dopaminergic system is sensitive to Iron state) decreased Haemoglobin levels also lead to decreased attentiveness, low neuronal metabolic activity, alteration of neurotransmission systems.[8] All these affect the cognition and psychomotor skills. Therefore impaired sensory motor skills in Anaemic patients is responsible for prolongation of Auditory reaction time. Other parameters like Visual Reaction time, CFFF, Scores of 100 pin dexterity test and Mini Mental test were also affected but not statistically significant.

CONCLUSION

In our study we have found that, Anaemia impairs Cognition & psychomotor skills. The impairment

of cognition is initiated by prolongation of Auditory reaction time rather than Visual reaction time. Further studies with larger sample size may be required to establish our findings.

Conflict of Interest : Nil

Source of Funding : Self

Ethical Clearance: Institutional Ethical Committee.

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Learning Style Preferences in I Year Medical Students based on VARK Questionnaire- A Descriptive Study

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ABSTRACT

Background: Learning styles are classified based on the sensory modality used to assimilate information. It could be visual, aural, read/write or kinesthetic. Each individual may prefer one or more sensory modality for internalizing information. Matching the learning style of students to the method by which information is delivered to the student ensures effective learning. Medical students are no exception to this

The aim of our study was to find out the learning modality preferences of I year medical students.

Settings and Design – Cross-sectional study design and descriptive study

Method and Material: A total of 187 I year MBBS students completed the paper format of VARK 7.8 questionnaire which was devised by Fleming. The descriptive data was represented in the form of pie charts

Statistical Analysis: Microsoft excel was used for statistical analysis. The findings were represented as pie charts.

Results: 68% of the students showed multimodality preferences. Of the multimodal, bimodal stood at a maximum of 30%. 65% of the bimodal had combination of auditory and kinesthetic predominance. Further, 75% of unimodal had kinesthetic preferences.

Conclusion: As most of the students had kinesthetic preference as unimodal or as part of multimodal preferences, introduction of active learning methods and computer assisted learning as part of IMBBS phase I curriculum would aid effective learning in medical students.

Keywords: *learning, active-learning, sensory modality preference, VARK.*

BACKGROUND

Every individual prefers one or more sensory modalities to receive information. The sensory modalities could be visual, aural, read/write and kinesthetic. While those with a strong visual modality preference prefer to learn through graphs, diagrams and charts, those with aural dominance prefer to hear a lecture or participate in discussion or listen to a guest lecture. Those with strong read-write sensory modality preference will prefer to read a book or notes or any written instructions either on paper or soft copy. The last modality is kinesthetic. A person with kinesthetic preference would prefer learning from practical exercises, examples, learning by trial and error and by doing the activity. A study of research literature on this topic reveals that one could have one or more preferences for learning. Knowledge of sensory modality preferences would facilitate learning[1].

Medical students are presented with huge load of information everyday as part of academics. Knowledge of their sensory modality preferences would enable students to modify their learning process and learn effectively. It could be used on an individual basis to facilitate learning. Teachers could also modify their teaching methods, having understood the sensory modality preferences of students, to present information,

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or modify teaching methodologies, to aid learning. [1,2].

The objective of this research project was to study the learning modality preferences of I year medical students

SUBJECTS, INSTRUMENTS AND METHODOLOGY:

Setting: IMBBS students of Bangalore Medical College and Research Institute

Study design: A cross-sectional, descriptive study design

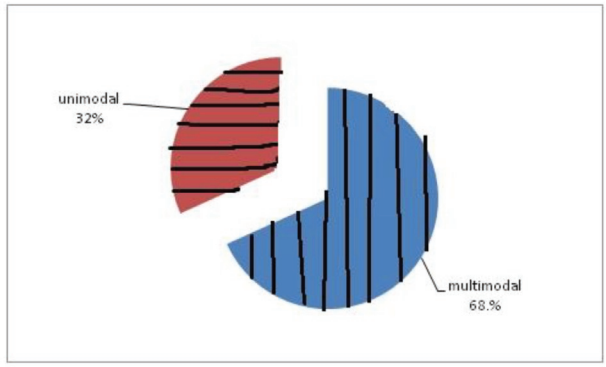
Subjects: Two hundred and ten medical students of IMBBS were enrolled in the study of which 187 students completed the given questionnaire. All students who submitted the completed questionnaire were included in our study. Unwilling I year medical students were excluded.

Instrument and methodology: The students were given paper format of VARK questionnaire 7.8, devised by Fleming, to complete[3]. The VARK 7.8 has 16 situations, each of which is followed by 4 choices. Each of the choices represents one sensory modality preference by which you could solve the problem. Subjects were instructed that they could select one or more answers by ticking the solutions they preferred. For example: you are helping someone who wants to go to the airport. The solutions are 1. You would go with her, 2. You would tell her the directions, 3. You would write down the direction and 4. You would draw or show her a map. Each of these 4 solutions is for kinesthetic, aural, read/write and visual preferences respectively. Students were instructed that they could opt for one or more than one preference, whichever describes them best.

Statistical analysis: The data was tabulated in Microsoft excel. Percentage of each subgroup in each group was determined using Microsoft excel. The descriptive data was represented in the form of pie charts in Microsoft excel .

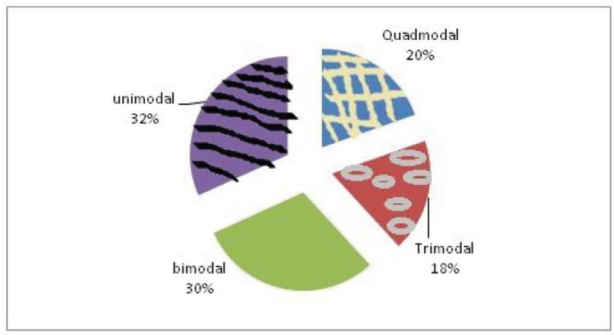
RESULTS

Piechart 1



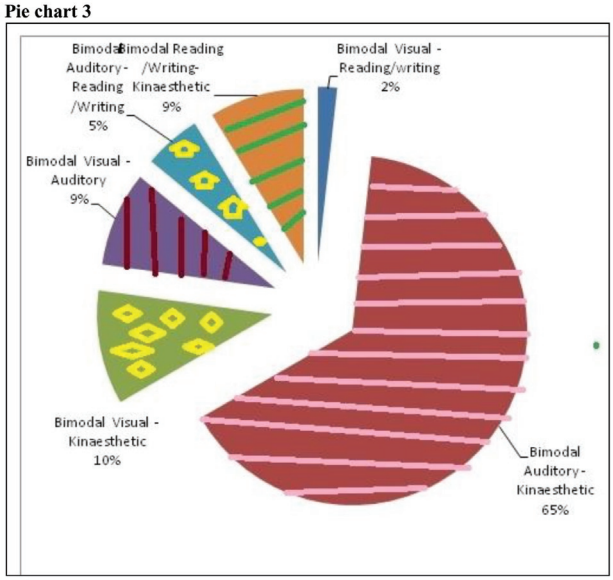
Pie chart 1 shows percentages of students who were multimodal and unimodal

Piechart2:



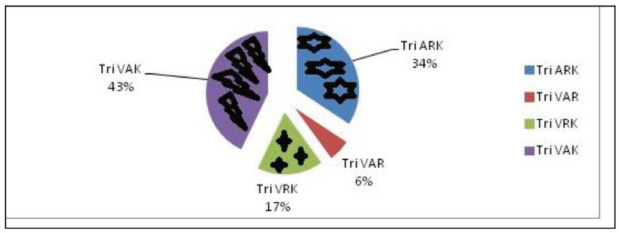
Pie chart 2 shows percentage of students who had unimodal, bimodal, trimodal and quadmodal learning style preferences.

Pie chart 3



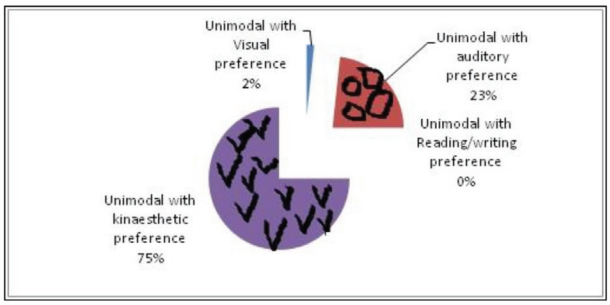
Pie chart 3 shows percentages of students who are auditory-kinaesthetic, visual- kinaesthetic, visual-auditory, auditory-read write, read-write–Kinaesthetic and visual-read write among students who have bimodal learning style preferences

Piechart 4



Pie chart 4 shows percentages of students who were auditory-readwrite-kinesthetic(ARK), visual-auditory-readwrite(VAR), visual-readwrite-kinesthetic(VRK) and lastly Visual–auditory–kinaesthetic(VAK) among those with trimodal learning preferences.

Pie chart 5



Piechart 5 shows percentages of auditory, read-write, kinaesthetic and visual preferences among students who were unimodal.

RESULTS

Pie chart 1 shows that majority of students were multimodal (68%) including bi, tri or quad modal preferences.

Pie chart 2 shows that unimodal were at 32%, the multimodal of 68 % were classified into Bimodal (30%) Trimodal (18%) and quad modal (20%).

Among the students with bimodal preferences, 65% of students preferred to learn by a combination of modality preference of auditory and kinesthetic as seen in piechart 3.

According to pie chart 4, 43% those with tri modal preferences were of Visual(V), Auditory(A), Kinesthetic (K) combination, the next highest was auditory(A),read-write(R)and kinesthetic (K)combination(34%) and last but one, Visual(V), read write(R) and Kinesthetic(K) at 17% and the least was Visual (V) Auditory(A) and Read Write(R) at 6%.

Pie chart 5 shows that highest fraction among those with unimodal preferences had Kinesthetic preferences.

DISCUSSION

Among the 189 participants in the study, 68% were multimodal and 32% were unimodal. Multi modal meant that they would use more than one sensory modality to assimilate information. Most of the multimodal were bimodal, next highest was quadra modal and trimodal was the least, accounting for 18% of total sample.

These findings are comparable with other studies. Lujan et al found multimodal preferences were higher than unimodal preferences in I MBBS students. Lujan et al found multimodality to be 63.8% in I year medical students, Baykan found it to be 63.9%, Nuzhat A found it to be 72.6% in medical students and Asiabar found it to be 51.6% in Iranian medical students [2, 4, 5, 6]

At Bangalore Medical College and research institute, classes for teaching I year MBBS students is mostly through theory lectures with power point presentation with charts, graphs and illustrations. This would aid those with visual preferences and aural preference. The text books on physiology prescribed for the medical students would be useful to those with visual and read-write modality preferences. The practical physiology for I Year medical students is for a two hour slot in the afternoon, with one 2hr slot per week. The hematology classes run for the first 4 months of the year. This is followed by human experimental physiology and clinical physiology classes which alternate during the next 6 months. The practical classes consists of a 30min demonstration by the tutors following which each of the students have to conduct the experiments of exercise tasks themselves guided by the tutors. Students have a prescribed practical manual since the beginning of the academic year. The practical manual contains relevant instructions for the practical and also contains the relevant theoretical aspects related to the practical classes. The practical classes will be definitely useful for those with kinesthetic preference while the manual would be helpful for those with read/write preferences. The disadvantaged group in this system of learning is those who have a kinesthetic preference as the lectures nor the textbook and notes would help them to learn theoretical concepts in the theory class. An effective solution to this lacuna is to introduce active learning strategies.

Active learning strategies could be either computer assisted or through group learning. Chickering has said that one cannot think that learning is a spectator sport.

It is only by discussing, speaking out that students can really make learning a part of themselves[7]. An example of active learning strategy is to divide the lessons into small portions. Students are instructed to learn a single concept by themselves. The next day at the class, a quiz is organized by the faculty to examine students on individual basis. Marks are allotted to the individual students. The quiz could be conducted after dividing students into random groups also. Another way of encouraging active learning is to present multiple choice questions at the end of the class. Two or three students form a group. They discuss among themselves and the group leader presents the answer. Points are awarded to the earliest correct answer[8, 9]. The above techniques of active learning would encourage team spirits in the students in addition to effective learning. These are few examples of active learning.

Another method of active learning would be computer assisted learning Programmes (CAL) Various computer assisted learning programmes are available for students. These could be used to simulate animal experiments. These programmes were initially popularized in India when animal experiment for physiology students was banned in India. A third example would be to use Human mannequins to practically learn topics like cardiopulmonary resuscitation. In addition to the above, faculty could explain topics like" baroreceptor reflexes in regulation of blood pressure" in custom made mannequins. These are a few examples of active learning strategies.

Limitations of the study: The sample was taken from I year students of Bangalore medical college and research institute. If the sample had been collected from more than one medical college in India, It would have been a better representation of medical students in India.

CONCLUSION

Multimodality learning preferences were common in I year medical students. Among those with unimodal preferences, kinesthetic preferences were common. Introduction of active learning strategies and computer assisted learning software would improve learning in I year medical students.

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Comparative Study on the Effects of Surya Namaskar & Spot Jogging on Respiratory Parameters: A Pilot Study

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ABSTRACT

Background: Respiratory disorders pose a huge public health problem imposing a very high economic burden in both the developed and developing countries. Changing lifestyles and modern industrial revolution has been very challenging for the human body to cope up with high stress & increasing pollution levels. In the ancient times, physical activity was very high & it was complemented with additional yogic practices which probably had additive effects on one's health. One of the most probable cost effective ways of improving the respiratory health of the population can be yoga. Surya namaskar is one such yogic practice; but little attention is paid towards the benefits that surya namaskar can have on health. Hence, we proposed to compare the effect of Surya namaskar with popular aerobic exercise like spot jogging on the respiratory parameters in young healthy subjects.

Aim: To evaluate the effect of surya namaskar and spot jogging of similar duration on respiratory parameters of healthy subjects and compare with each other.

Method: The subjects were randomly divided into 2 groups of 20 each. Group I performed surya namaskar and Group II performed spot jogging for 5 mins/day for duration of 6weeks. Respiratory parameters (TV, IC, VC, $FEV_{1,}$ MVV, and PEFR) were recorded before and after six weeks of training in each group by computerized spirometer.

Result: The study showed that TV, IC, VC, $FEV_{1,}$ MVV and PEFR increased significantly in both surya namaskar and spot jogging group. But, it was found that difference between the mean values (pre and post) among the two groups was statistically significantly higher for IC and VC in surya namaskar group.

Conclusion: Yoga can be equally effective or even better than spot jogging at improving various respiratory parameters.

Keywords: *Surya namaskar, spot jogging, respiratory parameters.*

INTRODUCTION

Modern revolution in industrialization has led to higher levels of pollution in both developed and developing countries. Higher pollution levels have led to increased incidence of various respiratory disorders. In 1990, the World Health Organization/World Bank Global Burden of Disease study estimated the global prevalence of chronic obstructive pulmonary disease (COPD) to be 9.33 per 1000 individuals for men and 7.33 per 1000 for women. The prevalence was observed to be higher in industrialized countries [1].

With the advent & advancements of technology, the modern man has become physically inactive & mind has become more stressful. The economic incentives also tend to promote physical inactivity which is disrupting the life totally [2-4].

There is evidence that reduced lung function is associated with increased mortality from chronic lung disorders. Epidemiological studies have shown

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correlation between lung functions, level of physical activity and respiratory disorders [5].

Physical activity in ancient India was done in the form of yogic practices which supposedly has definite cardio respiratory benefits which have now been proved scientifically. Reviews have shown that psycho-physiological changes by yoga help in improvement of both musculoskeletal and pulmonary functions. Long term yoga practice improves depth of breathing and alters chemoreceptive sensitivity [6-8].

One of these yogic practices is surya namaskar which is increasing in popularity due to its benefits on cardio-respiratory, musculoskeletal and metabolic health benefits but little attention has been paid to the extent to which the physical activity components of yoga have contributed to these benefits [9, 10].

This work was undertaken because there is scarcity of research which evaluates the physiological benefits of surya namaskar and aerobic exercise in the healthy subjects and weigh against the benefits at the same time. The aim of the study was to evaluate the effect of surya namaskar and spot jogging of similar duration on respiratory parameters in young healthy adults. Also the effects of surya namaskar and spot jogging on respiratory parameters were compared 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 or 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, after which a 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.

Baseline data were collected for all the participants after taking a detailed medical history. The following parameters were recorded; age, height, weight, BMI, tidal volume (TV), inspiratory capacity (IC), vital capacity (VC), FEV_1, maximum voluntary ventilation (MVV), peak expiratory flow rate (PEFR).

The pulmonary functions were assessed using computerized Spirolab II spirometer.

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 respiratory parameters were reassessed.

The 12 standard steps of surya namaskar was performed by the group I participants.[13]

During spot jogging, the leg rising was maintained by using a metronome (30 cycles/min). The subjects were watched to ensure that the thighs were parallel to the ground during stepping and the steps were taken at a regular rate.

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. Respiratory 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 & spirometric recordings (tidal volume, IC, VC, FEV_1, MVV and PEFR) 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 (basal) and post training respiratory parameters of surya namaskar and spot jogging group as shown in table-2 indicate that mean tidal volume, IC, FEV_1, MVV and PEFR of post surya namaskar group was significantly higher than that of pre surya namaskar group . There was also significant increase in mean tidal volume, IC, FEV_1, MVV and PEFR value in post spot jogging group as compared to pre spot jogging.

Table-2: Comparison of respiratory parameters among surya namaskar and spot jogging group

Variables	Group I (n=20)		Group II (n=20)	
	Pre surya namaskar	Post surya namaskar €	Pre aerobic exercise £	Post aerobic exercise ¥
TV(ml)	497.5±83.9	575.5±67.4***	457.0±59.2^	501.3±51.2*
IC (ml)	2222.5±515.5	2806.0±454.5***	2352.2±492.5^	2658.8±362.4*
VC (ml)	3119.5±613.6	3930.5±706.5***	3302.0±492.3^	3709.5±449.8*
FEV_1 (%)	81.1±3.9	83.4±2.7*	82.0±2.5^	84.0±2.5 *
MVV (L/min)	117.7±13.6	141.3±11.1***	130.1±25.2^	146.1±29.7 *
PEFR (L/min)	361.5±43.7	408.6±43.6**	393.5±67.1^	440.9±68.1**

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 respiratory parameters among surya namaskar and spot jogging group; statistically significant increase in IC and VC was observed in Group I as compared to Group II, whereas the difference in mean values of tidal volume, FEV_1, MVV and PEFR among the two groups was statistically insignificant(Table-3).

Table-3: Comparison of differences in the mean values of respiratory 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
TV (ml)	78.0±69.6	44.3±75.9	0.152
IC (ml)	582.0±301.5	306.6±236.1	0.003
VC (ml)	811.0±402.8	407.5± 270.5	0.001
FEV_1 (%)	2.3±2.3	2.0±3.3	0.720
MVV (L/min)	23.6±13.7	16.1±16.0	0.120
PEFR (L/min)	47.2±26.5	47.4±33.0	0.984

p value <0.05 is significant; >0.05 is not significant) by independent t test

DISCUSSION

Our study showed that respiratory parameters changed significantly in surya namaskar group as well as spot jogging group. Surya namaskar group showed a statistically significant increase in mean values of tidal volume, IC, VC, FEV_1, MVV and PEFR following practice of surya namaskar.

These findings are consistent with Bal et al., who have also reported a statistically significant improvement in tidal volume, IC and VC values in the group performing rope mallakhamb along with asanas over the group not performing asanas [11].

Bhutkar et al., in their study found a statistically significant increase in VC, MVV after 6 months of practice of surya namaskar in MBBS students. Sasi et al., also showed a statistically significant increase in PEFR values following 45 days daily practice of surya namaskar on healthy school students. Khanam et al., also found an increase in PEFR values in asthma patients after practice of different yoga asanas twice a day for seven days; but it was found to be statistically insignificant[7,12,13].

Chanavirut et al., reported a statistically significant increase in $FEV_{1,}$ while a statistically insignificant increase in tidal volume after 6 weeks practice of five positions of hatha yoga on healthy subjects [12,14]. Trans et al., observed a statistically insignificant increase in values of FEV_1 following practice of hatha yoga by healthy subjects [15].

In our study the group performing spot jogging also showed a statistically significant increase in tidal volume, IC, VC, FEV1, MVV and PEFR following 6 weeks of spot jogging.

White et al., also reported that there was a significant increase in VC after 12 weeks exercise program in young and middle aged non-obese women [16]. Moodi et al., in a clinical trial on 60 subjects (14-18 years), performing stationary bicycle and roping in different groups, found a significant increase in VC and FEV_1 after aerobic exercise training in both groups [17]. Porszasz et al., showed that after 7 weeks of exercise training (high intensity cycle ergometer) by COPD patients, when compared with pre training parameters, a statistically significant increase in IC was observed [18]. This increase in FEV_1 is similar to the study done by Farid et al., who reported an increase in FEV_1 and PEFR values after eight weeks of aerobic exercise in asthmatic patients [19].

In a population based cohort study by Jakes et al., consisting of 12,238 men and women aged 45-47 years found that physical activity is associated with higher levels of FEV_1 [5]. Hallatrand et al., in their study reported a statistically significant increase in MVV values, but an insignificant increase in FEV_1 values after aerobic conditioning in asthmatic patients [20].

Our study reported a very highly significant ($p<0.001$) increase in tidal volume, IC, VC and MVV in surya namaskar group while only significant ($p<0.05$) improvement in spot jogging group. On comparing surya namaskar group with spot jogging group for the difference between the mean values (pre and post); the increase in IC and VC were found to be significantly ($p<0.05$) more in surya namaskar group while the

difference in tidal volume, MVV, FEV_1 and PEFR was not found to be statistically significant.

De Godoy et al., compared maximum inspiratory pressure and FEV_1 in yoga and aerobic exercise group; they reported a statistically insignificant improvement in maximal inspiratory pressure and FEV_1. However, the absolute variation in maximal inspiratory pressure was greater amongst those practicing yoga [21].

Prakash et al., in their study compared PEFR and FEV_1 of yogis, athletes and sedentary workers. They found that yogis have a statistically significant higher PEFR as compared to other two groups while FEV_1 was higher and statistically significant in yogis and athletes as compared to sedentary workers [22].

In conclusion, results from our study and other studies comparing the effects of yoga and aerobic exercise seem to indicate that, in both healthy and diseased population, yoga may be equally effective or even better than aerobic exercise at improving various respiratory parameters. However, a few studies have reported insignificant change in the respiratory parameters before and after the intervention. Since there are conflicting results, larger number of studies are needed with more number of subjects for validation of results.

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Oxidative Stress and Antioxidant Activity in Down Syndrome

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ABSTRACT

Background:- Down syndrome or trisomy 21 is the single most common genetic cause of mental retardation. It has been postulated that the oxidative stress due to overexpression of superoxide dismutase (*SOD-1*) gene on chromosome 21 leads to the high morbidity associated with the Down syndrome. **Method**:-This case control study was done to assess the oxidative stress and the antioxidant activity in Down syndrome. Karyotypically proven 25 cases of Down syndrome (DS) and 25 normal subjects were selected for the study .Serum Malondialdehyde (MDA) levels, erythrocytic catalase(CAT) activity, erythrocytic G6PDH activity, whole blood glutathione peroxidase (GPX) levels and serum uric acid (UA) levels were estimated. Stastical analysis was done using independent sample t test , p value of<0.05 was considered significant. **Result**:- The MDA values, CAT values and UA values were significantly elevated (p<0.000) in DS. The GPX values were significantly decreased and G6PDH values did not show any significant change. **Conclusion**:-In this study, significant oxidative stress exists in DS inspite of the activation of antioxidant enzymes and increased uric acid production to combat the oxidative stress . Apart from antioxidants and dietary supplementation , prospective and interventional studies are required in this field to effectively decrease oxidative stress and its consequences in DS .

Keywords:*-DS (Down syndrome), Serum Malondialdehyde (MDA), erythrocytic catalase(CAT), erythrocytic G6PDH , whole blood glutathione peroxidase(GPX) , serum uric acid(UA).*

INTRODUCTION

Down syndrome (DS) or trisomy 21, first described in 1866, is the most common autosomal aneuploidy causing mental retardation[1]. Trisomy of chromosome 21 leads to cumulative effects of primary gene products of alpha / beta interferon receptor, phospho ribosyl glycinamide synthetase, cystathionine beta synthase, liver – type 6-phospho fructokinase aminoimidazole ribonucleotide transferase, and cytoplasmic superoxide dismutase (*SOD-1*)[2,3] .

SOD1 catalyzes the conversion of superoxide anion into hydrogen peroxide (H_2O_2). H_2O_2 in turn is degraded by catalase (CAT) and glutathione peroxidase (GPx) into water and molecular oxygen. H_2O_2 produced in excess is as a result of increased SOD1 activity without the concomitant increase of complementary antioxidant defense mechanisms, such as CAT and GPx activity. The accumulation of Reactive Oxygen Species(ROS) through the Haber–Weiss–Fenton reactions damages important cellular components by oxidizing biomolecules[4]. Because of this increased oxidative stress the DS subjects are at increased risk of cataract , thyroid disorders, Alzheimers dementia, premature ageing, leukemia, diabetes mellitus, hypogonadism, vascular disease and amyloidosis[5].

Oxidative stress is defined as "an imbalance between oxidants and antioxidants in favour of the oxidants, potentially leading to damage".[6] The markers of oxidative stress are malondialdehyde (MDA) and 4-hydroxynonenal as markers of lipid damage, isoprostan due to arachidonic acid oxidation, and 8-oxoguanine and thymine glycol due to oxidative DNA damage. It causes hazardous events such as lipid peroxidation, oxidative DNA damage, derangement of physiological adaptation

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phenomena and intracellular signalling[7].

The damaging effects of highly reactive oxygen and nitrogen species are prevented by a wide spectrum of antioxidative defense mechanisms such as Vitamin E,Vitamin C , carotenoids, metabolites such as uric acid , glutathione, and antioxidant enzymes such as glutathione peroxidase, Glucose 6 Phosphate dehydrogenase and Catalase [6,7].

Many previous studies have shown a significant association of superoxide dismutase levels in DS [8,9,10]. This study evaluated the oxidative stress levels in DS by MDA estimation and the role of first line defense by preventive antioxidants (erythrocytic glutathione peroxidase , Catalase , Glucose 6 Phosphate deHydrogenase, serum Uricacid) in the Down Syndrome.

MATERIALS AND METHOD

25 cases of clinically diagnosed Down syndrome was selected for this study, after obtaining the consent from their parents, from Manovikas Special School For Mentally Handicapped, Kollam, Kerala,India. Diagnosis of DS was confirmed by Karyotyping at Genetika,Centre for advanced genetic studies, Thiruvananthapuram, Kerala, India. 25 age and sex matched normal children and individuals were selected as controls from the neighbourhood .Cases and controls with acute or chronic illness were avoided from the study. 6ml of blood was collected in lithium heparin tubes.3ml was send for karyotyping.3ml of blood was taken for biochemical analysis of oxidative stress markers .This study was done to assess the association of Down syndrome with levels of oxidative stress parameters like Malondialdehyde and the antioxidant activity by assessing the Catalase, Glutathione Peroxidase, Glucose 6 Phosphate Dehydrogenase and Uric acid levels. Ethical clearance was obtained from Institutional ethics committee ,Government TD medical college , Alappuzha. (No.B6/14038/2011/TDMCA,EC66/2014).

Karyotyping:- Peripheral blood lymphocyte micro culture was performed as described by Moorhead et al[11]. GTG banding was performed as described by Seabright [12] and chromosomes were identified according to International System for Human Cytogenetic Nomenclature, (ISCN 1995).

Malondialdehyde estimation (MDA) was done using Valipasha and Sadasivudu method in nmol/L[13] .Catalase activity was measured by the Hugo Aebi method and expressed as Kat/gmHb[14] .G6PDH activity was measured with the speed of absorbance increase at 340 nm due to the reduction of $NADP^+$,in mU /10^9eryth rocytes.Glutathione peroxidase estimation was measured by the decrease in absorbance at 340 nm on mixing the blood sample with Drabkins reagent and cumene hydroperoxide in U/L of whole blood.Quantitative determination of uric acid was done according to Trinder reaction in mg/dl [15].

Statistical analysis

Quantitative variables were described by mean and standard deviation . Between group comparison of quantitative variables were assessed by independent sample t test. Relationship between quantitative variables were assessed by Pearson correlation. A p value of <0.05 was taken as level of significance.

RESULTS

Karyotyping :- 80% of the cases showed trisomy of chromosome 21, 47XY+21/47XX+21 pattern by GTG banded karyotyping.16% showed Robertsonian translocation , of which 12% showed der (14;21) and 4% showed der (21;21). 4% cases showed mosaicism , 46XY+25% 47,XY,+21.

Table:- 1: Shows the values of oxidative stress and antioxidant enzyme activity in DS and controls.p<0.05 considered significant.

Variable	Case/control	number	Mean value	sd	p value
MDA (nmol/L)	DS	25	120.0	28.6	0.000
	Control	25	60.2	6.6	
Catalase (Kat/gmHb)	DS	25	102.9	22.1	0.000
	Control	25	77.4	0.6	
GPX (u/l)	DS	25	945.4	324.1	0.000
	Control	25	5501.0	1145.9	
G6PDH (mu/10^9erythrocyte)	DS	25	120.8	17.6	0.150
	Control	25	126.2	5.8	
Uricacid (mg/dl)	DS	25	5.7	1.5	0.000
	Control	25	3.3	0.7	

DISCUSSION

The Down syndrome cases in this study , compared to controls, showed a mean MDA value of 120nmol/ 100ml ($p<0.001$) .This shows that a significant oxidant stress exists in DS and they are at risk for the oxidative stress induced disorders. Increased MDA activity has been reported from previous studies across the world [16-19,34]. This persistent oxidative insult forms the reason for neurological and haematological abnormalities and accelerated ageing process ,in DS[20].

In this study, the level of CAT activity in the DS is 102.9 Kat/gmHb and in controls is 77.4 Kat/gmHb . This shows a significant increase of CAT activity in DS ($p<0.001$). This is due to overactivity of CAT (ch 11p13) to combat the increased oxidative stress.. Elevated [21-23] and low catalase activity [24,25] have been reported in earlier studies on DS.

The G6PDH levels in Downs syndrome did not show any significant association in this study. G6PDH fuels the first reaction of the pentose phosphate pathway and maintains a continuous supply of NADPH as the obligatory substrate for the glutathione system protecting cells against oxidative stress [34].Since the NADPH production is not increased it can affect the GPX activity in this study.Most of the earlier studies in DS has reported an increase in G6PDH activity [23].

The GP_X shows a significant decrease in activity in DS ($p<0.001$, DS = 945.4u/l ,controls = 5501 u/l) when compared to controls . Elevated [16,22,23] , insignificant [25] and low [16,26-29] GP_X activity has been found in many previous studies. To detoxify hydroperoxides, GPx needs the participation of GSH (glutathione) as a co-factor leading to the formation of its oxidized form (GSSG), which is very toxic to cells. Hence, depletion of GSH may also contribute to the relatively low GPx activity in this study as reported previously[4,28]. Glutathione peroxidases (GPx) are selenium-dependent enzymes and the low GP_X activity has also been attributed to the low selenium concentration in the population in previous studies [29-32] .

The Uric acid levels were significantly raised in DS cases ($p<0.001$).This is in accordance with previous reports[28,34,37].The peroxy nitrite dependent DNA damage is characterised by overproduction of uric acid . Hyperuricemia in children with DS has also been attributed to the elevated activity of erythrocyte adenosine deaminase and adenine phosphoribosyl transferase activities [34]. Glomerular dysfunction can also contribute to hyperuricemia in DS individuals[35]. Another possibility is the induced increase of UA level, as an important antioxidant of plasma, by oxidative stress which reduce the peroxil radical to hydroperoxide, blocking its transformation to toxic aldehydes like MDA[4].

The results of karyotyping in this study were similar to karyotyping results across the world as cited by Fayza et al[38]. Mosaics have shown normal enzyme activities in a previous study by Nagwa et al [39].

The significantly increased Oxidative stress in the DS cases of this study,occurs due to the failure of *in vivo* antioxidant mechanisms despite the significant increase in their activity of CAT and overproduction of Uric acid. The peripherally decreased GP_X activity was corrected by selenium supplementation in some previous studies [30,31]. Mega doses of vitamins and antioxidants have failed to produce any response in the DS as per double blind studies[40]. Supplementation therapy studies has been suggested with selenium , vitamin E, zinc ,vitamin A , betacarotene and ubiquinone [29].

The ultimate goal of research on Down syndrome should be to improve the lives of people with Down syndrome and their families. Human chromosome 21 has already been mapped and the mRNA and protein synthesis has been quantified . Trisomy mouse models of DS like Ts65Dn is being used as it possesses many physical, behavioural and neurological features that are reminiscent of those seen in people with Down syndrome[41]. But still, it requires the integration of research in numerous disciplines, such as cognitive neuroscience, neurology, psychiatry, mouse and human genetics, bioinformatics and computer modelling of the regulation of metabolic and/or signalling pathways for better understanding of oxidative stress in DS [41].

CONCLUSION

There is significant systemic oxidative stress in Downs syndrome and this leads to the activation of various antioxidant mechanisms within the body. But in this study the *in vivo* antioxidant mechanisms does not combat the oxidative stress and hence the DS subjects are at risk of various oxidative stress disorders.There may be a role for using antioxidants and supplements to decrease the morbidity in DS. Hence, research should

be enhanced in this field to find promising antioxidants that can overcome the oxidative stress in DS as well as in general population.

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Relation Between Emotional Intelligence and Blood Groups in First Year Medical Graduates – A Questionnaire based Study

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ABSTRACT

Aim : To determine the relation between emotional intelligence and blood groups (ABO system) in first year medical graduates

Introduction : Emotional intelligence depicts how to manage behavior, navigate social complexities, and make personal decisions that achieve positive results. Emotional intelligence is made up of four core skills that pair up under two primary competencies: personal competence and social competence.

Materials and Method: After obtaining informed consent, EI score of 135 medical graduates were assessed using by Schutte et al questionnaire. Their blood groups were also entered in the questionnaire,

Results: In our study, there was significant relationship between Emotional intelligence and ABO system. Blood group B having higher emotional intelligence score than the other two groups namely A & O.

Keywords : *Emotional intelligence, Schutte questionnaire, ABO blood group.*

INTRODUCTION

Emotional Intelligence (EQ or EI) is one element in a broad spectrum of skills that enables an individual to create value for oneself and others. Emotional intelligence includes the ability to perceive emotions, use emotions to facilitate thought, understand emotional information and to regulate emotions[1]

Assessment of emotional intelligence is an important factor in determining students adjustment and educational achievements. The first year in college presents wonderful opportunities to know different academic disciplines. But since college is very different from high school, students may experience a lot of changes that can lead to problems. It is believed that emotional intelligence may explain differences in the quality of intrapersonal and interpersonal relationships and contribute to job performance and management effectiveness and predict success. Since there were no studies relating ABO blood group with EI, we decided to go with this study.

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METHODOLOGY

After obtaining informed consent, 135 first year medical graduates were chosen for the study. Their emotional intelligence was assessed using EI scale developed by Schutte et al. The scale comprises of 33 questions and the participants were instructed to rate the extent they agree or disagree with each statement on a five-point Likert scale. The final EI score was calculated by summing their responses. Their blood groups were also obtained. Both the data were correlated and statistically analyzed.

Questionnaire used in the study:

1. I know when to speak about my personal problems to others.
2. When I am faced with obstacles, I remember times I faced similar obstacles and overcame them.
3. I expect that I will do well on most things I try.
4. Other people find it easy to confide in me.
5. I find it hard to understand the nonverbal messages

of other people.

6. Some of the major events of my life have led me to re-evaluate what is important and not important.
7. When my mood changes, I see new possibilities.
8. Emotions are some of the things that make my life worth living.
9. I am aware of my emotions as I experience them.
10. I expect good things to happen.
11. I like to share my emotions with others.
12. When I experience a positive emotion, I know how to make it last.
13. I arrange events others enjoy.
14. I seek out activities that make me happy.
15. I am aware of the nonverbal messages I send to others.
16. I present myself in a way that makes a good impression on others.
17. When I am in a positive mood, solving problems is easy for me.
18. By looking at their facial expressions, I recognize the emotions people are experiencing.
19. I know why my emotions change.
20. When I am in a positive mood, I am able to come up with new ideas.
21. I have control over my emotions.
22. I easily recognize my emotions as I experience them.
23. I motivate myself by imagining a good outcome to tasks I take on.
24. I compliment others when they have done something well.
25. I am aware of the nonverbal messages other people send.
26. When another person tells me about an important event in his or her life, I almost feel as though I have experienced this event myself.
27. When I feel a change in emotions, I tend to come up with new ideas.
28. When I am faced with a challenge, I give up because I believe I will fail.
29. I know what other people are feeling just by looking at them.
30. I help other people feel better when they are down.
31. I use good moods to help myself keep trying in the face of obstacles.
32. I can tell how people are feeling by listening to the tone of their voice.
33. It is difficult for me to understand why people feel the way they do.

The participants were instructed to rate the extent they agree or disagree with each statement on a five-point Likert scale.

1 = strongly disagree

2 = disagree

3 = neither disagree nor agree

4 = agree

5 = strongly agree

The final score was calculated by summing their responses. The data obtained was statistically analyzed.

RESULTS

The maximum and minimum total scores are 165 and 33 respectively. The statistical analysis was done using ANOVA.

BLOOD GROUP	NO OF STUDENTS	MEAN OF EI SCORE	'F' STAT	P VALUE
A	N = 30	121.033	4.44	0.01* (significant)
B	N = 44	127.09		
O	N= 55	120.43		

In our study, there was significant difference with p value of 0.01(which is highly significant) between the groups and within the group. The Mean value of B group showed 127.09(had higher EI score) compared to A and O group. A group showed mean value of 121.033 and O group showed mean value of 120.43. Blood group B having higher emotional intelligence score than the other two groups namely A & O.

DISCUSSION

Emotional intelligence plays a very important role in leadership, work life and career development. Intelligent quotient (IQ) predicts only about 20 percent of career successes, which leave the remaining 80 percent to other factors one among being emotional intelligence[2].Low EI may hinder the academic success and adjustment throughout the medical training. In another study conducted by Thompson et al in medical students showed no relationship between blood type and intelligence, emotions and personality. [2]

In another study done by Aditya Gupta et al stated that, as emotional intelligence increases, the level of perceived stress decreases [3]. In another study, done by Iranfar et al, in undergraduates, the correlation between Rh type and emotional intelligence groups was 0.136 and this correlation in 0/2 significance level had been reported significant. It also showed positive groups can receive upper scores of EI than negative ones and negatives groups have less scores of EI than the other.[4]

But, we had no relevant studies supporting the relation between blood group and emotional intelligence.

CONCLUSION

This study concludes that there is a correlation between ABO group with emotional intelligence and hence sufficient measures can be taken to improve EI in the beginning of the medical curriculum which would make students more stress free during their training years at medical college[5].

Ethical Clearance- Taken

Source of Funding - Self

Conflict of Interest - Nil

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Role of Yoga in Lipid Profile in Patients of Type 2 Diabetes Mellitus (DM)

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ABSTRACT

Background: This study was conducted to see the role of Yoga in improving lipid profile in diabetic subjects.

Method: Out of 77 patients of diabetes, 36 were in group 1st (control group) and 41 patients were in group 2nd (study group). Yogic exercises were practiced by study group for 3 continuous months.

Result: In this study significant improvement in lipid profile was found i.e triglyceride decreased from 151.15±23.92 mg/dl to 123.17±29.31 mg/dl ($p < 0.001$) and HDL increased from 38.67±6.51 mg/dl to 46.51±5.51 mg/dl ($p<0.001$). When both control and study group were compared after 3 months a significant statistical improvement was found TG ($t=4.40$; $p < 0.001$), HDL ($t=-6.670$; $p < 0.001$) respectively.

Conclusion: There is significant improvement in various lipid profile in diabetic subjects.

Keywords: *Yoga, Diabetes mellitus, lipid profile.*

INTRODUCTION

Diabetes is affecting approximately 300 million people throughout the world. It is a syndrome characterized by chronic hyperglycemia and disturbance of carbohydrate,fat and protein metabolism associated with absolute or relative deficiency in insulin secretion and/ or insulin action.

Poor glycemic control is associated with higher level of stress in both adolescents as well as adults. Stress also affects metabolic control directly by stimulating auonomic nervous system to initiate neuroendocrine stress response,that tend to produce hyperglycemia. Exercise also improves tissue sensitivity to catecholamines especially in white adipose tissue, thereby enhancing lipolysis and providing more non essential fatty acid for utilization by skeletal muscles.Physical training in type 2 diabetes mellitus patients has been reported to produce antiatherogenic lipid profile. Yogic exercise is beneficial for diabetic patients and that includes Health rejuvinating exercise,Abdomen exercise,Asanas,Kayots arga (relaxation),Anupraksha and Preksha Dhyan which means concentration of perception and not of thought.On physical level Preksha helps each cell to revitalise itself. It facilitates digestion, makes respiration more efficient and improves circulation of blood. It decreases FFA,LDL,VLDL and increases HDL.

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AIM AND OBJECTIVES

To see the role of yoga in improving lipid profile in patients of type 2 Diabetes mellitus (DM).

MATERIAL AND METHODS

The study was conducted in post graduate department of Medicine in S. N. Medical College, Agra. In this study initially we had screened 100 patients randomly but 23 patients were excluded who lost to follow up in subsequent visit. Hence this study was conducted in 77 patients of diabetes mellitus who were either attending out patient or in patient department or diabetic clinic of S.N Medical college, Agra. Out of 77 patients of diabetes, 36 were in group 1st (control group) and 41 patients were in group 2nd (study group). A detailed clinical history was taken especially the past

history of disease and of medication.

Exclusion Criteria :

- Person unwilling to participate
- H/o liver ‘or Kidney disease
- Pregnant females
- Diabetics >8 yr. of history of diabetes
- Hypo/hyperthyroidism
- Any other endocrine disorder

Diagnostic Criteria :

For diabetes :

- Fasting Blood glucose level (BGL) ≥ 126 mg/dl (7.0 mmol/L) on two separate occasions.
- Post Prandial BGL ≥ 200 mg/dl (11.1 mmol/L).
- A random plasma glucose level of 200 mg/dl (11.1 mmol/L) or more.

Lipid Profile

Estimation of serum triglyceride – The serum triglyceride (STG) was estimated by liquid gold GPO-PAP triglyceride reagent supplied by Span Diagnostics,Surat on semi-autoanalyser.

Estimation of HDL – HDL cholesterol was estimated in serum by liqid gold PEG-CHOD-PAP,End Point Assay with Lipid Clearing Factor on semi-autoanalyser.

Patient examination:

Group 1st : These patients took conventional treatment and unsupervised exercise protocol at home and serve as control group.

Group 2nd : These patients besides conventional treatment were gone through the supervised exercise protocol. It served as study group. Following yogic exercises were practiced daily or at least 5 times a week for continuous 3 months :

1. Health rejuvenating exercises (5 minutes)
2. Body posture (Asanas)

a. Surya namaskar/parmeshwar vandana (3 minutes)

b. Paschimottanasana (3 minutes)

c. Ardhamatsyasana (3 minutes)

d. Uttanpadasana (3 minutes)

e. Sarwangasana (3 minutes)

f. Matsyasana (3 minutes)

3. Abdomen exercise (7 minutes)
4. On every alternate day either :

a. Relaxation exercises (kayotsarga) (30 minutes)

or

b. Preksha meditation including pranayama and anupreksha (30 minutes).

OBSERVATION AND RESULT

TABLE-1: Age and Sex distribution

Parameters		Group 1st (n=36)		Group 2nd (n=41)		T	P
		Mean	SD	mean	SD		
Age (yrs)		49.90	10.98	53.00	7.98	1.710	<0.10
Sex (M/F)		12F	24M	11F	30M	$\chi^2$0.774	NS
Lipid Profile	TG	156.24	33.93	151.15	23.92	1.057	NS
	HDL	39.78	6.80	38.67	6.51	0.684	NS

Group 1st = control group; group 2nd =study group

TABLE-2: Comparison of lipid profile of two groups at pre treatment

Parameter	Group 1st			Group 2nd			T	P
	Mean	SD	SE	Mean	SD	SE		
TG	156.24	33.93	3.99	151.15	23.92	2.64	1.057	NS
HDL	39.78	6.80	0.80	38.67	6.51	0.72	0.684	NS

The comparison of lipid profile (i.e TG,HDL) of two groups at pretreatment was statistically insignificant (t=1.057,0.684, and p>0.05;respectively).

TABLE-3: Comparison of lipid profile of two groups at post treatment

Parameter	Group 1st			Group 2nd			t	P
	Mean	SD	SE	Mean	SD	SE		
TG	143.00	33.19	3.91	123.17	29.31	3.24	4.40	<0.001
HDL	45.21	5.43	0.64	46.51	5.51	0.61	-6.670	<0.001

After 3 months there is statistically significant improvement in lipid profile i.e in TC,TG,HDL,VLDL and LDL (t=4.40,-6.670; < 0.001, < 0.001 respectively;)

TABLE-4: Comparison of lipid profile of 2nd group (yoga) pre-treatment and post-treatment

Parameters	TG		HDL	
	0 month	3 months	0 month	3 months
Mean	151.15	123.17	38.67	46.51
SD	23.92	29.31	6.51	5.51
SE	2.64	3.24	0.72	0.61
T	12.341		22.028	
p	<0.001		<0.001	

The comparison of lipid profile in group 2nd i.e. TG decreased from 151.15±23.92 mg/dl to 123.17±29.31 mg/dl and HDL increased from 38.67±6.51 mg/dl to 46.51±5.51 mg/dl. This was statistically significant (t = 12.341,22.028, p < 0.001 and < 0.001 respectively).

DISCUSSION

As diabetes dyslipidemia is the important risk factor for various complications and there is significant improvement in lipid profile by yogic life style intervention.In this study significant improvement was found in lipid profile i.e triglyceride decreased from 151.15±23.92 mg/dl to 123.17±29.31 mg/dl (p<0.001) and HDL increased from 38.67±6.51 mg/dl to 46.51±5.51 mg/dl (p<0.001).When both groups were compared after 3 months a statistically significant improvement was seen TG (t=4.40; p<0.001),HDL (t=-6.670; p<0.001) respectively.

CONCLUSION

So the conclusion of study is that, there is significant improvement in lipid profile parameters.Hence it is revealed in our study that Yoga is traditional and cost effective alternative mode of treatment.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Taken from college ethical committee.

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Comparison of Arterial Stiffness in Healthy Volunteers and Chronic Smokers Using Pulse Wave Velocity

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ABSTRACT

Background - Arterial stiffness is a growing epidemic associated with increased risk of cardiovascular events, dementia, and death. Decreased compliance of the central vasculature alters arterial pressure and flow dynamics and impacts cardiac performance and coronary perfusion. These complications are responsible for negative effect on quality of life with smoking. Hence it has become important that chronic complications are recognized early and necessary interventions are made.

Material & Method - 24 smokers aged between 20 - 40yrs, with duration of smoking more than 3yrs and 24 non smokers aged between 20 - 40yrs were selected and subjected for Lead II ECG recording and finger pulse photoplethysmography.

Aim : 1. To determine arterial stiffness in healthy volunteers by recording pulse wave velocity .

2. To compare pulse wave velocity in healthy volunteers and chronic smokers.

Results: There was a positive correlation between duration of smoking and PWV with r value 0.26. An increase in the systolic and diastolic blood pressure was observed with out significance. The resting heart rate was also markedly increased. The mean PWV in control group and test group was 4.2 mts/sec and 5.48 mts/sec respectively.

Conclusion: Arterial stiffness in simple term describes the rigidity of arterial wall. Arterial stiffness can be analyzed by recording pulse wave velocity. Therefore complete understanding the effects of smoking on vascular endothelium can prevent deleterious complications.

Keywords – *Pulse Wave Velocity (PWV), Arterial stiffness, Chronic smoking , Radial artery, Pulse Transit Time (PTT).*

INTRODUCTION

Smoking is one of the primary cause of preventable illness. Smoking harms nearly every organ of the body and reduces both quality of life and life expectancy.

It is estimated that the global yearly death toll as a result of tobacco use is currently 6 million (including exposure to secondhand smoke). On current smoking trend this is expected to rise around 10 million a year by 2030. It is predicted that by the end of the 21st century, tobacco will have killed one billion people.

Most smoking-related deaths are from one of three types of disease: lung cancer, chronic obstructive pulmonary disease (COPD) & Coronary Heart Diseases(CHD). [1]

Arterial stiffness is a general term for the elasticity (or compliance) of the arteries. Structural and cellular changes results in hardening or stiffening of the arteries which is called arteriosclerosis. Arterial stiffening is a marker for increased cardiovascular disease risk such as Coronary Heart Diseases. The stiffness of arteries indicates how hard the heart has to work to pump blood through the body.

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Smoking is one of the most important factor which increases arterial stiffness and this accelerates the sclerotic process. Smoking even a single cigarette leads to short-term rise in arterial wall stiness and increase in heart rate.

Smoking not only accelerates endothelial dysfunction in the large arteries, it is also responsible for changes in the physical properties of arterioles and small arteries. Vascular endothelium produces a number of mediators including nitric oxide (NO) which regulates arterial wall stiffness owing to smooth muscle tone changes.

Vascular stiffness, increases the load on the ventricles, decreases cardiac ejection. Blood ejecting into a stiffer arterial system , generates high end-systolic pressure for the same net stroke volume using greater energy. Chronic ejection into a stiffer vasculature induces cardiac hypertrophy.

Vascular stiffening also changes the manner by which the heart is perfused. Isolated systolic hypertension (defined as systolic blood pressure > 140 and diastolic blood pressure < 90 mm Hg) and elevated pulse pressure are two clinical manifestations of decreased vascular distensibility (Increases vascular stiffness).

Pulse wave velocity helps in assessment of arterial stiffness. It increases in certain diseases that are associated with increased cardiovascular risk .[2]

Photoplethysmography (PPG) is a non invasive method for the measurement of arterial blood volume changes at a peripheral site where the blood vessels are close to the skin. It is an instrument mainly used to determine and register the variations in blood volume or blood flow in the body which occur with each heartbeat. Here infrared light rays are transmitted through index finger to measure pulse wave.

The plethysmogram waveform represents pulsatile peripheral blood flow, which reflects both peripheral and central hemodynamics. [3]

AIM OF THE STUDY

1. To determine arterial stiffness in healthy volunteers by recording pulse wave velocity .

2. To compare pulse wave velocity in healthy volunteers and chronic smokers.

MATERIAL AND METHOD

After getting clearance from ethics committee, written informed consent was taken from all the participants and detailed clinical examination was done as per study protocol. All experiments were performed in the Department of Physiology, Narayana medical College, Nellore.

Participants

The test group includes of 24 smokers , aged between 20 - 40yrs, with duration of smoking more than 5yrs. Control group includes 24 healthy volunteers who were fairly matched by subject characteristics.

Inclusion criteria

1) Subjects aged 20 – 40 yrs.

2) Males.

3) Smokers using beedi/ cigaratte (more than 5yrs)

4) No history of diabetes mellitus / Hypertention or other systemic disorders.

Exclusion criteria

1) Subjects aged < 20 and > 40 yrs.

2) Females.

3) Smokers using beedi/ cigaratte (less than 5yrs)

4) History of diabetes mellitus / Hypertention or other systemic disorders.

Height & weight were measured by using stadiometer & digital weighing balance.

BMI was calculated by using the formula Weight in Kg/ Height in meter square.

Blood Pressure and Heart rate were recorded by using automated B.P. apparatus.

(National model EW 252 W)

The subjects of both control group and smokers group were asked to come to the laboratory in the morning hours between 9 am to 11 am and they were rested for a period of 10 minutes after instrumentation

was done. Later blood pressure and heart rate were recorded in supine position. For recording ECG Lead – II, three electrodes were connected one to the right arm , one to the left leg and one to the right leg. On the left hand forefinger photo pulse device was connected. The subject was asked not to make movements as it induces noise while recording of photo pulse plethysmography (PPG) and ECG.

Lead II ECG module and infrared light based finger photo pulse plethysmography device were custom built in the biomedical engineering department. Lead – II ECG along with finger photo pulse plethysmography were recorded in two channels of audacity software synchronously. The analog signals of both the devices was digitized by using the sound card of the computer for measurement of Pulse Transit Time [PTT].

In this way recording was done using audacity software for a minimum of 15 min. The distance[D] between the left forefinger and the right second intercostal space was measured in meters. The time between the R wave of Lead II ECG and the beginning of the finger pulse was measured as the Pulse Transit Time. Then by applying the formula Velocity = Distance/Pulse Transit Time. Thus velocity was calculated as meters/ second.

Figure showing recording of ECG (Top) & Finger pulse (bottom).

Statistical analysis was done using the student-t test. Data was represented as mean ± standard deviation. The significance was taken when the p value was < 0.05. Table1 shows the general characteristics of the subject. Table- 2 shows the cardiovascular parameters of the subjects.

Table - 1 General characteristics of the subjects

Parameters Mean ± SD	Normal subjects	Smokers
Age (yrs)	22.04 ± 1.20	26.95 ±4.22
Height (cms)	165.83 ± 9.32	168.18 ± 7.67
Weight (Kgs)	69.33 ± 11.56	69.90 ± 9.0
BMI	25.43 ± 5.16	24.69 ±2.58

Table - 2 Cardiovascular parameters of smokers

Parameters Mean ±SD	Healthy volunteers	Smokers
SBP (mmHg)	129.71 ± 12.78	134.79 ± 17.46
DBP (mmHg)	82.17 ± 9.59	84.6 ± 19.73
HR (b/mt)	89.29 ± 13.22	94.4 ± 15.2
PWV (mt/sec)	4.2 ± 0.40	5.48 ± 0.62

Though we see an increase in systolic and diastolic pressures in the test group there is no statistical significance. There was an increase in the resting heart rate in the test group when compared to control group but with no statistical significance. PWV was measured by using R wave of Lead II ECG & left index finger photo pulse plethysmography. In our study we have found that mean PWV in smokers was 5.48 mts/sec ± 0.68 which was higher than the normal value

4.2 mts/sec ±0.4 with out any significance. The normal values of PWV what we have obtained are similar to study done by J.M Padilla et al. [4] using similar method.

There was a positive correlation between duration of smoking and PWV with r value 0.26 . Our results are similar to study conducted by svatopluk Bindera et al in which stiffness index increases with increase in duration of smoking. [5]

DISCUSSION

Arterial stiffening reflects the changes of arterial wall degeneration. It has become clear that, the arterial

stiffness is not only determined by structural elements with in vessel wall and distending pressure, but also by functional regulation by the sympathetic nervous system and endothelium of the vessel wall. Increase in arterial stiffness may results in higher systolic blood pressure; lower diastolic blood pressure and wide pulse pressure all conferring greater cardiovascular and total mortality risk. Increased arterial stiffness through an elevation of SBP enhances the left ventricular load and favors cardiac hypertrophy and through reduction of DBP, results in a decrease in the perfusion pressure of the coronary arteries, thus contributing to myocardial ischemia.

CONCLUSION

Endothelial damage is a central feature in the evolution of vascular disease induced by cigarette smoking and may act as a precursor for future atherosclerosis. Measuring arterial stiffness provides good data on the endothelial condition. In our study we have seen increase in PWV which is a early marker of arterial stiffness. Therefore complete understanding the effects of smoking on vascular endothelium can prevent deleterious complications.

Over the next few years measurement of arterial stiffness might become an important part of risk assessment. It will become necessary for physicians both in primary care and hospital practice to understand the importance of arterial stiffness and different techniques are available for its clinical assessment.

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Prevalence of Thyroid Dysfunction Found in Type II Diabetes Mellitus Patients at Tertiary Care Centre in Jharkhand

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ABSTRACT

Background: Hypothyroidism and diabetes share clinical sign and symptoms, such as fatigue, lethargy and weight gain. Population with diabetes experience very high rate of morbidity and mortality from a variety of disease condition. The ability to diagnose and treat unsuspected thyroid disorder in these populations may greatly enhance quality of life.

Aims and Objectives: To study the pattern of thyroid dysfunction in patients with type 2 Diabetes mellitus.

Method: It was a cross sectional study done on type 2 diabetes mellitus patients. 100 cases and 50 controls were included in the study. Diabetic patients on medication that alter thyroid functioning, patients with previously known thyroid dysfunction & pregnant women were excluded from the study. Detailed history was taken; physical examination and required investigations were conducted on patients who satisfied inclusion & exclusion criteria. Investigations done were fasting Plasma glucose, TSH, FT_3 and FT_4. Differences between various parameters were considered statistically significant when the p value was <0.05.

Results: The prevalence of thyroid dysfunction in this study was 27% in which 25% had hypothyroid while only 2% had hyperthyroid.

Conclusions: The present study shows that the prevalence of thyroid dysfunction is high in type 2 DM patients hence regular monitoring of TSH levels in diabetic patients should be suggested.

Keywords: *Thyroid dysfunction, Type 2 Diabetes Mellitus, TSH, FT_3, FT_4*

INTRODUCTION

Thyroid dysfunction and diabetes mellitus are the two most common endocrine disorders encountered in clinical practice and they mutually influence each other. Thyroid disorders can have a major impact on glucose control, and untreated thyroid disorders affect the management of diabetes in patients[1].

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The relationship between thyroid disorders and diabetes mellitus is characterized by a complex interdependent interaction such as hyperthyroidism impairs glycemic control in diabetic subjects, while hypothyroidism may increase susceptibility to hypoglycaemia thus complicating diabetes management. It has been shown that thyroid dysfunctions are more prevalent in people with diabetes. Furthermore, it seems that unidentified thyroid dysfunction could negatively impact diabetes and its complications. Therefore management of subclinical hypothyroidism in patients with diabetes may prove beneficial. [1]

AIMS AND OBJECTIVES

To study the pattern of thyroid dysfunction in patients with type 2 Diabetes mellitus.

MATERIALS AND METHOD

A). Selection of cases: - Subjects for the study were selected from the Diabetes mellitus patients in the inpatients of medicine and surgery department of Rajendra Institute of Medical Sciences, Ranchi. A total of 100 type 2 diabetic patients, who satisfied inclusion and exclusion criteria were included in the study after a well informed consent obtained from them.

Inclusion Criteria

o Subjects were diagnosed patients of Type- II Diabetes Mellitus who previously had fasting plasma glucose levels of ≥ 126 mg/dl and were receiving treatment such as combination of Insulin and oral hypoglycaemic agents or only oral hypoglycaemic agents.

o Diabetics irrespective of glucose control.

o Diabetics Irrespective of their age and sex.

o Patients had neither sign nor symptoms of thyroid abnormalities or were not assessed earlier.

o **Exclusion criteria**

o Subjects who did not consent for the study.

o Pregnant women.

o Patients on medication that alter thyroid function.

o Diabetic Patients with previously known Thyroid dysfunction.

B). Selection of Control :- A total of 50 control were selected of same age group of cases from the attendant of the indoor patients, hospital staff of Rajendra Institute of Medical Sciences, Ranchi. All these individuals were healthy and clinically euthyroid at the time of assessment and there was no history suggestive of thyroid disease. None of these individuals had family history of diabetes mellitus neither of them were taking any drugs including oral contraceptives and had given the consent for the study.

Biochemical investigation

The estimation of fasting plasma glucose level was done by GOD/POD method. The serum TSH, $FT_{3,}$ and FT_4 levels were done by ELISA Microwells method and the readings were taken at 450 nm in a strip ELISA reader.

DATA ANALYSIS

The results were statistically analysed by using the student's t- test and the probability (p value) was calculated using SPSS software. A p-value of <0.001 was taken as highly significant, a p-value of <0.05 as significant and p-value of >0.05 as non-significant.

RESULTS

Table –1; Comparison of mean age of diabetic and non-diabetic subjects

Age	Diabetic subjects (n=100)	Non Diabetic subjects (n=50)
Mean ± S.D	57.66 ± 11.58	56.62 ± 11.54

The mean age of diabetic subjects was 57.72 ± 11.43 whereas mean age of non-diabetics was 56.62 ± 11.52. The mean age was slightly higher in diabetics.

Table –2; Age distribution of Thyroid prolife in Case and Control.

	Diabetic subjects (n=100)				Non Diabetic subjects (n=50)			
Age group	**Total no.**	**Euthyroid**	**Hypo thyroid**	**Hyper thyroid**	**Total no.**	**Euthyroid**	**Hypo thyroid**	**Hyper thyroid**
25 – 34	6	4	0	2	4	4	0	0
35 – 44	6	4	2	0	3	3	0	0
45 – 54	20	19	1	0	10	10	0	0
55 – 64	26	14	12	0	13	12	1	0
>65	42	32	10	0	20	20	0	0
Total	**100**	**73**	**25**	**2**	**50**	**49**	**1**	**0**

Table-2 shows that 25 patients (25%) of case group (diabetic subject) had hypothyroidism and only 2 patients (2%) had hyperthyroidism, so the prevalence of thyroid dysfunction in diabetic subject was 27% while only 1 person (2%) of control group (non-diabetic subject) had hypothyroidism.

Maximum percentage of thyroid dysfunction (46.1%) was in the age group of 55 to 64yrs in diabetic subjects while in non-diabetic subjects, only one case of hypothyroid was identified and it was also from the same age group.

Table—3: Serum thyroid hormone levels in case and control group

Parameter	Diabetic subjects (n=100) Mean ± S.D	Non Diabetic subjects (n=50) Mean ± S.D	't' value	'p' value
TSH	5.328 ± 4.766	2.075 ± 1.283	4.734	0.0001ˣˣ
FT_3	2.188 ± 1.372	2.676 ± 0.8324	2.309	0.02ˣ
FT_4	1.164 ± 0.59	1.463 ± 0.344	3.317	0.0011ˣˣ

ˣp-value <0.05 –significant, ˣˣp-value <0.001 –highly significant

Table--3 shows that the levels of TSH (5.32 ± 4.76) in case group was significantly higher (p<0.0001) than the control group (2.07 ± 1.28) while FT_3 (2.18 ± 1.37) in case group was significantly lower (p=0.02) than control group (2.67 ± 0.83) and FT_4 (1.16 ± 0.59) in case group was significantly lower (p=0.001) than control group (1.46 ± 0.34). So, the result of the study shows low thyroid hormone level and high serum TSH level in diabetic subject as compared to normal healthy non diabetic control.

DISCUSSION

The maximum percentage of thyroid dysfunction (46.1%) was in the age group of 55 to 64yrs in diabetic subjects while in non-diabetic subjects, only one case of hypothyroid was identified and it was also from the same age group. The results of the present study are in accordance with the previous studies of Flatau E et al[2], Jain G et al[3], Michalek AM et al[4], Whitehead C et al[5], Feely J et al[6], Vondra K et al[7], Moulik PK et al[8] and Johnson JL et al[9] who also found high prevalence of thyroid disorders with advancing age. So it can be suggested that elderly subjects should be screened for hypothyroidism.

In the present study the prevalence of thyroid dysfunction in diabetic subjects was 27% while only 2% in non-diabetic subjects which is in agreement with the study done by Pasupathi et al[10], CEJ Udiong[11], Celani MF et al[12], Radaideh et al[13], Akbar DH et al[14], Papazafiropoulou et al[15] and Díez JJ et al[16].

The abnormal thyroid hormone levels may be the outcome of the various medications the diabetics were receiving. For example, it is known that insulin, an anabolic hormone, enhances the levels of FT4 while it suppresses the levels of T3 by inhibiting hepatic conversion of T4 to T3. On the other hand, some of the oral hypoglycemic agents such as the phenylthioureas are known to suppress the levels of FT4 and T4, while raising the levels of TSH.

The thyroid hormone leves FT3 and FT4 in diabetic subjects were significantly lower than the normal healthy non diabetic control group which was in accordance with Sandip Sendhav et al[17], Pasupathi et al[10], C.E.J. Udiong et al[11] and Vinu Vij et al[18] in which they also showed statistically significant low thyroid hormone level in diabetes mellitus patient as compared to normal healthy control.

In many earlier studies done by Sandeep Sendhav etal[17],Bharat eta al[19], Mushir Ahmad et al[20], total T3 and T4 were investigated but in the present study we opted to investigate FT3 and FT4 in the subjects as the total thyroid hormone (T3 & T4) concentration is dependent on the concentration of thyroid binding proteins. Thus any condition that affects the level of thyroid binding protein will affect the total thyroid hormone level. In opposite to it the free thyroid hormone (FT3 & FT4) is

not affected by changes in the concentration of thyroid binding protein and so the free thyroid hormones assay generally are considered to provide the more reliable indicator of true thyroid status [21].

Altered thyroid hormones have been described in patients with diabetes especially those with poor glycaemic control. In diabetic patients, the nocturnal TSH peak is blunted or abolished, and the TSH response to TRH is impaired. Reduced T_3 levels have been observed in uncontrolled diabetic population. This "low T_3 state" could be explained by impairment in peripheral conversion of T_4 to T_3 that normalises with improvement in glycaemic control. Higher levels of circulating insulin resistance have shown a proliferative effect on thyroid tissue resulting in large thyroid size with increased formation of nodules. [1]

Abnormal thyroid hormone may prevail in diabetics and would be aggravated in poorly controlled diabetics. Stress, which is associated with diabetes mellitus, may also cause changes in the hypothalamus anterior-pituitary axis in these diabetics. It appears that the presence of hypothyroidism and hyperthyroidism may result from hypothalamus-hypophyseal-thyroid-axis disorders as suggested by Celani et al. [12]

An another study in which Suzuki et al[22]. concluded that the abnormal thyroid hormone levels found in diabetics due to the presence of thyroid hormone binding inhibitor (THBI), an inhibitor of the extrathyroidal conversion enzyme (5'-deiodinase) of T4 to T3 , and dysfunction of the hypothalamo-pituitarythyroid axis.

CONCLUSION

In this study we conclude that thyroid dysfunction is more prevalent in patients of type 2 diabetes mellitus patients which were further found to be more in elderly patients and patients with uncontrolled diabetes. Thus a systemic approach to thyroid testing in diabetic subject is favourable, however no definitive guideline exist regarding screening for thyroid dysfunction in diabetic patients. So it is suggested that regular screening for thyroid abnormalities in all diabetic patients will allow early treatment of subclinical thyroid dysfunction in these population may greatly enhance the quality of life.

Ethical Clearance: Procedures were in accordance with the ethical committee of the institute (IEC/IAEC – 06/2013) Rajendra Institute of Medical Sciences, Ranchi.

Conflict of Interest: None

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Neutrophil-Lymphocyte Ratio: A Risk Predictor in Patients with Type 2 Diabetes Mellitus

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ABSTRACT

Type 2 Diabetes Mellitus (DM) is an endocrinal disorder with an underlying systemic inflammation. Glycated haemoglobin (HbA1c) levels are an indicator of blood glucose regulation; increased HbA1c levels may be associated with increased risk of cardiovascular complications. Patients with type 2 DM feature important modification of both Low Density Lipoprotein (LDL) and High Density Lipoprotein (HDL) particles which are likely to play an important role in the development of atherosclerosis. Neutrophil-Lymphocyte ratio (NLR), a novel-potential marker of inflammation, has been linked to adverse outcomes in various cardiac pathologies. Hence the study was aimed at correlating NLR with HbA1c and LDL/HDL. Sixty Type 2 diabetics were selected randomly in Medall Clumax Diagnostics according to the eligibility criteria. Haemogram, HbA1c and Lipid profile were tested. NLR was found to be higher in patients with HbA1c > 7%. Using Pearson's correlation coefficient, NLR was found to increase with increase in HbA1c and LDL/HDL which was statistically significant ($p < 0.05$). Hyperglycaemia and Dyslipidaemia induce activation of pro-inflammatory cytokines resulting in a constantly elevated neutrophilic count and also cause insufficient lymphocyte proliferation. To conclude, unregulated diabetic patients have a higher NLR; hence are at a higher risk of cardiovascular complications.

Keywords: *Diabetes Mellitus, HbA1c, LDL/HDL, Neutrophil-Lymphocyte Ratio, Cardiovascular complications.*

INTRODUCTION

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia. Several distinct types of DM are caused by a complex interaction of genetic and environmental factors. The metabolic dysregulation associated with DM causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system [1].

With an increasing incidence worldwide, DM will be a leading cause of morbidity and mortality for the foreseeable future [1]. According to the latest figures from the Centers for Disease Control and Prevention (CDC), Worldwide, an estimated 387 million adults are living with diabetes, and this number is projected to increase to 592 million by 2035. Nearly 9 out of 10 new diabetes cases are type 2 diabetes, which has a natural history characterized by a gradual increase in glycaemia [2].

Many epidemiological studies have highlighted that chronic low grade inflammation is associated with DM [3]. Several studies that explored the relationship between systemic inflammation and cardiovascular diseases indicated that chronic inflammation promotes the acceleration of diabetic microangiopathy in addition to the development of macroangiopathy in diabetic patients [4].

Neutrophil-Lymphocyte Ratio (NLR) is the ratio of the number of neutrophils to that of lymphocytes. It is a simple, cost-effective and useful inflammatory marker which has been studied in many inflammatory diseases, cardiovascular diseases and cancer [5].

Cardiovascular disease (CVD) is the major cause of morbidity and mortality in patients with type 2 DM and they are at two to fourfold increased CVD risk over non-diabetic subjects. Abnormalities of lipid metabolism, observed in type 2 DM are one of the major factors contributing to vascular risk. Patients with type 2 DM feature important modification of both Low Density Lipoprotein (LDL) and High Density Lipoprotein (HDL) particles which are likely to play an important role in the development of atherosclerosis [6].

HbA1c (Glycosylated haemoglobin) reflects average plasma glucose over the previous eight to twelve weeks [7]. In DM, higher amounts of glycated hemoglobin, indicating poorer control of blood glucose levels, have been associated with cardiovascular disease, nephropathy, neuropathy, and retinopathy [8].

There is, however, little information, concerning a correlation between NLR, LDL/HDL and HbA1c. Hence the study was taken up with the following objectives: (1) To determine NLR (2) To correlate NLR with HbA1c and LDL/HDL.

MATERIALS AND METHOD

This cross-sectional study was started after obtaining clearance from the Ethical committee of Bangalore Medical College and Research Institute, Bengaluru. Study was carried out between October and November 2015.

Study population:

60 subjects, who came to Medall Clumax Diagnostics, Bengaluru, were selected randomly according to the inclusion and exclusion criteria. Subjects who were known Type 2 diabetics, in the age group of about fifty to seventy years, possessing verbal communication skills were included in the study. Subjects with acute or chronic inflammation, infections, hypertension, cardiovascular or cerebrovascular disorders, malignancy, acute or chronic renal and hepatic dysfunction, haematological disorders, autoimmune diseases, peripheral vascular diseases, obesity, smoking and alcohol intake were excluded. Also subjects who were receiving medications affecting leucocyte count, chemotherapy or radiotherapy, who have undergone surgery in the past 3 months were not taken up for the study.

Methodology:

Fifty to seventy year old Type 2 Diabetics were chosen randomly in Medall Clumax Diagnostics, Sadashivnagar, Bengaluru. They were explained about the study in detail. Written informed consent was taken. General physical examination and systemic examination were done to rule out any pathology. This was followed by collection of blood samples in the same laboratory under aseptic precautions. Blood samples were used to assess Complete Haemogram, HbA1c and lipid profile.

Statistical analysis:

Statistical analysis was performed with SPSS software (version 19.0, IBM). Values were expressed as mean ± standard deviation. Independent Student's t-test was used to compare the data among the subjects. Pearson product-moment correlation coefficient was used to correlate NLR with HbA1c and LDL/HDL. p-value ≤ 0.05 was considered statistically significant.

RESULTS

The results of the blood tests were noted. Subjects were divided into 2 groups based on the HbA1c values. Those with HbA1c $\leq$ 7% (regulated diabetes) were included in Group 1 and those with HbA1c > 7% (unregulated diabetes) were included in Group 2 [9]. Accordingly Baseline characteristics of the subjects are showed in Table 1. There was no significant difference between the two groups with respect to Age, Duration of Diabetes and BMI.

Table 1: Baseline characteristics of the subjects divided into two groups

Characteristics	Group 1 (n=9)	Group 2 (n=51)	p value
Age (years)	62 ± 5.88	59.7 ± 5.95	0.29
Duration of Diabetes (years)	5.55 ± 3.33	5.94 ± 3.17	0.74
BMI (kg/m^2)	25.6 ± 4.5	24.8 ± 4	0.58

The haematological parameters of the subjects belonging to both the groups are given in Table 2.

NLR was calculated from the report of Complete Haemogram as follows:

Absolute Neutrophil Count = Differential Neutrophil Count x Total Leucocyte Count

Absolute Lymphocyte Count = Differential Lymphocyte Count x Total Leucocyte Count

NLR = Absolute Neutrophil Count

Absolute Lymphocyte Count

Table 2: Haematological parameters of the subjects of both the groups

Parameters	Group 1	Group 2	p value
Differential Neutrophil Count (%)	63.5 ± 8	65.1 ± 5.1	0.44
Differential Lymphocyte Count (%)	32.1 ± 5.7	26.8 ± 4	0.001 *
Total Leucocyte Count (cells/cumm)	6002.2 ± 1517.5	7116 ± 1642.1	0.06
Absolute Neutrophil Count (cells/cumm)	3823.3 ± 1090	4664.3 ± 1256.8	0.06
Absolute Lymphocyte Count (cells/cumm)	1926.3 ± 635	1920.1 ± 568.4	0.9
Neutrophil-Lymphocyte Ratio	2.08 ± 0.59	2.48 ± 0.43	0.02 *
HbA1c (%)	6.73 ± 0.17	8.5 ± 1	1.42
LDL (mg/dl)	124.7 ± 34.8	163 ± 60.4	0.07
HDL (mg/dl)	36.7 ± 9.6	36.9 ± 9.04	0.9
LDL/HDL	3.8 ± 1.95	4.7 ± 2.4	0.27

It can be clearly seen in the Table 2 that most of the haematological parameters did not differ significantly between the groups. However, there was a statistically significant difference in Differential Lymphocyte Count and Neutrophil-Lymphocyte Ratio between the two groups (p = 0.001 and p = 0.02 respectively). Subjects belonging to Group 2 had a significantly lower Differential Lymphocyte Count and a significantly higher NLR. This difference in NLR has been represented graphically in Figure 1.

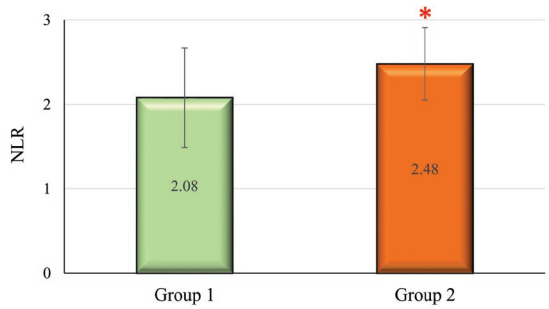

Figure 1: Comparison of Neutrophil-Lymphocyte Ratio (NLR) between Group 1 & Group 2

On applying Pearson product-moment correlation coefficient, it was found that there was a significant positive correlation between NLR and HbA1c; NLR and LDL/HDL which have been depicted in Figure 2 and 3.

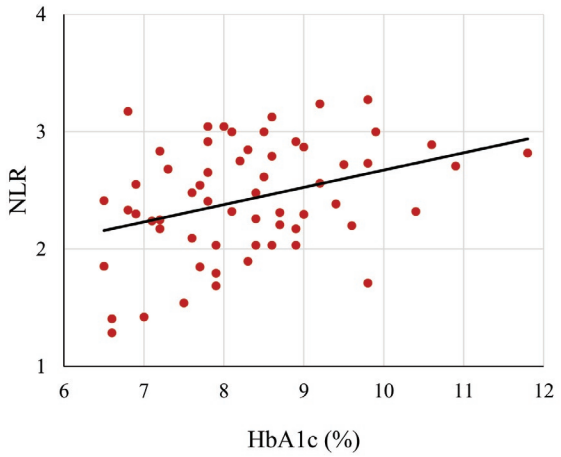

Figure 2: Correlation between Neutrophil Lymphocyte Ratio (NLR) and HbA1c levels

r = 0.35; p = 0.006

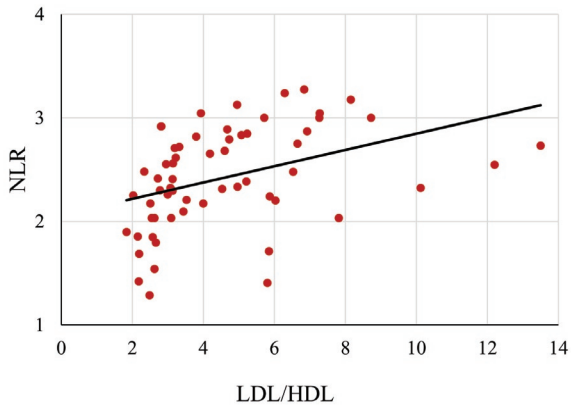

Figure 3: Correlation between Neutrophil Lymphocyte Ratio (NLR) and LDL/HDL

r = 0.39; p = 0.001

DISCUSSION

In this current study, we found that Neutrophil-Lymphocyte Ratio (NLR) was significantly higher in the Group 2 (HbA1c >7%). And NLR increased with the increase in HbA1c levels and LDL/HDL.

A higher neutrophil count and / or lower lymphocyte count can lead to a higher NLR. In the presence of hyperglycaemia, the natural rate of formation of Advanced Glycation End products (AGE) is greatly accelerated. AGEs are formed as a result of non-enzymatic reactions between intracellular glucose-derived dicarbonyl precursors with the amino groups of both intracellular and extracellular proteins. AGEs bind to a specific receptor (RAGE), which is expressed on inflammatory cells (macrophages and T cells), endothelium, and vascular smooth muscle. AGE-RAGE signaling axis within the vascular compartment results in the release of pro-inflammatory cytokines and growth factors from intimal macrophages [10] such as C - reactive protein (CRP), Interleukin-6 (IL-6), Tumour Necrosis Factor-α (TNF-α) and Monocyte Chemoattractant Protein-1 (MCP-1) which results in a constantly elevated neutrophilic granulocyte count [4].

On the other hand, intracellular hyperglycemia stimulates the de novo synthesis of Di-acyl Glycerol (DAG) from glycolytic intermediates and hence causes activation of Protein Kinase C (PKC). The downstream effects of PKC activation are numerous; one such is production of pro-inflammatory cytokines by the vascular endothelium [10] resulting in increased neutrophil count.

It is well established that there is decreased expression of Interleukin-2 Receptor (IL-2R) on activated lymphocytes in Type 2 Diabetics. This results in insufficient lymphocyte proliferation; hence a reduced lymphocyte count [11]. As a result of increased neutrophilic count and a reduced lymphocytic count secondary to hyperglycaemia, we found an increase in the NLR in those subjects with higher HbA1c levels and there is a tendency for the ratio to increase with the increase in the levels of HbA1c.

LDLs provide the main pathway for transporting cholesterol and phospholipids into mammalian cells. They have been assigned a central role in initiating atherogenesis. During this process, LDLs are known to get accumulated and subsequently oxidized either due to Reactive Oxygen Species (ROS) or hyperglycaemia in the arterial intima [12, 13]. The action of oxidized LDLs (oxLDLs) is mediated by oxLDL receptors found on the cell membranes of endothelial cells, smooth muscle cells and macrophages. OxLDLs activate NADPH oxidase, resulting in ROS overproduction and cellular oxidative stress. ROS subsequently activate the nuclear factor kappa B (NF-κB) pathway. Nuclear factor kappa B is activated by various stimuli and acts as a final pathway in regulating the expression of several genes, especially multiple inflammatory cytokines such as intercellular adhesion molecule-1 and monocyte chemoattractant protein-1. This causes recruitment of leucocytes [13] in various tissues and could have led to, specifically, an increased neutrophilic count.

HDLs inhibit the expression of cell surface adhesion molecules by activated endothelial cells. This is attributed to the inhibition of sphingosine kinase and further inhibiting the nuclear translocation of NF-κB. Furthermore, HDLs inhibit ROS generation and chemokines induced by oxLDLs [12]. When there is a reduction in HDL, there is a lack of the above-said inhibition, leading to recruitment of inflammatory cells in the arterial walls, and increase in the cell count. This could explain how LDL and HDL can influence the neutrophil and lymphocyte counts.

The findings in the present study also support the findings in those studies done earlier. A study done by Sefil et al showed that there may be a significant relationship between NLR and blood glucose regulation. The authors proposed that increased NLR may be associated with elevated HbA1c in patients with type 2 diabetes mellitus [9]. Lou et al also found that increased NLR was significantly associated with Insulin Resistance (IR), and high NLR values may be a reliable predictive marker of IR [4]. Tok et al investigated the neutrophil–lymphocyte ratio in healthy young men with low high-density lipoprotein cholesterol compared with controls and concluded that the neutrophil–lymphocyte ratio is significantly elevated in asymptomatic healthy young men with low high-density lipoprotein cholesterol compared with control participants [14].

There are a few limitations in the present study. We acknowledge that the sample size of our study was relatively small. There was a significant difference in the number of subjects belonging to the two groups, which could have been avoided with a large sample size.

CONCLUSION

This study proposes that unregulated diabetic patients have a higher neutrophil-lymphocyte ratio; hence are at a higher risk of cardiovascular complications.

Clinical implication

Determining Neutrophil-Lymphocyte Ratio with a simple blood test, Complete Haemogram, will help us predict the risk of development of complications in patients with Type 2 Diabetes Mellitus. This in turn would help us take appropriate actions at appropriate time.

Conflict of Interest: The authors declare that there is no conflict of interests regarding the publication of this paper.

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Gender Variation in Short Term Auditory and Visual Memory

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ABSTRACT

Introduction: Memory is a collection or storage of numerous information learnt by experiences. Visual and auditory senses are responsible for the new short term memory formation.

Objectives: The present study was planned to evaluate auditory and visual short term memory status in healthy young adults of Uttarakhand in 60 subjects (30 male and 30female subjects), 17-21 years of age.

Results: The results suggested Statistically significant higher scores of "Memory Test " in women in comparison to men.($p<0.001$).Mean score of memory test was better for visual memory than auditory memory in men and a similar result was obtained in women. Further scores of visual memory were better in women than men and highly statistically significant.

Conclusion: Young males and females of Garhwal region on short term memory tests have shown better results for Visual Memory than Auditory Memory and further females have given better results than males for both Auditory Memory and Visual Memory.

Keywords: *Auditory memory, visual memory, Garhwal.*

INTRODUCTION

Visual and auditory senses are responsible for the new short term memory formation.(1). Short term memory can be defined as an initial memory buffer that allows us to hold a few units of information for a short period of time while we determine their importance (2). Short term memory is readily available to conscious awareness & because of the limited capacity of short term memory, it may work better to rapidly combine the related pieces of information into larger units based on similarities, differences or other patterns. This combining process is called chunking and it is important to make short term memory work more effectively (3). Short memory is an example of how the brain processes information differently when it is either received through visual stimuli or through auditory stimuli which are both sensory processes.(4) Short term memory is formed by both auditory and visual information but cortex can process more auditory than visual information at one time, especially when broken into manageable "chunks", thus in the short term memory, auditory information plays a more important role than visual information. Although we usually remember only about seven items in the short term, we can remember longer strings of information, such as telephone or social security numbers, by breaking them into chunks. The way that different sensations are recorded in the brain makes the most difference in how short- term memories are formed.(5).

On the basis of various theories to determine which gender has better short-term memory or better capacity to retain recent events; many conclusions are being contemplated .Intellectually genders seem to be fairly equal; however, cognitive abilities differ greatly among males and females. Our thought processes occur in the brain & it is not surprising that males and females could differ how they process information. The men have better short term memory for certain instances such as

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logical manoeuvres like direction, electronic circuitry, mathematical reasoning and navigation etc [5].

Women, on average, excel on tests that measure recall of words and on tests that challenge the person to find words that begin with a specific letter or fulfill some other constraint. Women perform better than men in both verbal memory and verbal fluency finds a large difference in memory [5,6].

The present study was undertaken with the objective to observe whether there is a difference in short term memory of males and females which is of academic interest. In view of the studied data, incidence of age related memory deficiency can also be observed.

AIMS & OBJECTIVES-

The present study was planned to evaluate memory status in healthy young adults of both sexes in Uttarakhand region with following aims –

- Being a new state, this study will provide data which will be of academic interest especially to observe any gender variation related to memory.
- Secondly, by knowing the status of memory of healthy young adults, data will be available to compare it with the diseased states, related to memory.
- By comparing auditory and visual memory we can implement the better method to form the memory which will be more consistent.

MATERIALS & METHOD

- The present study was conducted in **the Department of Physiology of Shri Guru Ram Rai Institute of Medical and Health Sciences, Patel Nager, Dehradun**.
- The study was carried out on 40 subjects (20 subjects of each sex) of 17-21 years of age.
- The subjects were divided into two groups:
  - 20 Male Subjects – Group I.
  - 20 Female Subjects – Group II.
- All the subjects were of similar educational and socio-economic status.
- Subjects fulfilling the following criteria were included in the study:

1. Subjects were fit physically and mentally.
2. Subjects were non-smoker and non-alcoholic.
3. Subjects were free from any optic and auditory disease.

- Subjects were screened and excluded for medical conditions known to impact cognitive functions e.g. neurological disorders, head injury, cardiovascular disease, hypertension and diabetes mellitus etc.
- Informed consent was sought from all the subjects.
- All the subjects were tested for auditory and visual memory.

Method

- Each test planned was neutral in nature i.e. for both males and females there was equal tendency to recall.
- Subjects were made familiar about the process of tests to be done.
- At a time one subject was tested for visual & auditory memory in a well-lighted & noise free room.
- First the subject was exposed to visual memory test and after that to auditory memory test.

Visual Memory Test

- 20 familiar small sized different articles were arranged in a tray.
- Articles were shown to subject for 60 seconds only .After that 30 seconds were given to the subject to recall.
- Thereafter, the subject was asked to write name of these articles on a sheet of a paper within 60 seconds.

Auditory Memory Test

- The observer pronounced names of 20 different articles (other than those articles used in visual memory) in front of the subjects. A definite pause was given after naming each article).
- Then 30 seconds were given to the subject to recall them.
- After 30 seconds, the subject was asked to write name of all the articles on a sheet of paper within 60 seconds.
- After collecting the data, number of correct answers was calculated from both the tests and analyzed statistically.

Statistical analysis: was done by using ‘’Microsoft Excel software.’’

• Test applied: Student 't' test (paired and unpaired).

• Significance criteria:

P value: > 0.05 Not significant

< 0.05Significant*

< 0.001Highly significant**

< 0.001Very highly significant***

Observations & Results

The present study was carried out on 20 male and 20 female subjects of 17-21 years of age. They were divided into 2 groups; Group I (Males) & Group II (Females) subjects.

Mean ± sd of score of correct responses for auditory memory test in all the subjects is **12.07 ± 2.18** while for visual memory test it is **13.48 ± 2.0 (Table 1).** Score of correct responses is better for visual memory and the difference is statistically highly significant.

Table-1: Auditory Memory and Visual Memory in all subjects

	Auditory Memory (n=40)	**Visual Memory (n=40)**
Mean ± sd	12.07±2.18	13.48±2.06
p value	<0.01**	

In male participants, mean ± sd of the correct responses for auditory memory test is **10.75 ± 2.1** and for visual memory test is **12.3 ± 1.84 (Table 2).** Score of correct responses is better in group I for visual memory and the difference is statistically highly significant. In female participants of Group II, mean ± sd of correct responses for auditory memory test is **13.4 ± 1.27** and for visual memory test is**14.65 ± 1.57.** Score of correct response is better for visual memory in group II and the difference is statistically highly significant. Score of correct responses of the auditory memory test of group II is better than visual memory test of group I and difference is statistically not significant.

Table-2: Auditory Memory and Visual Memory in Male and Female Subjects

	Auditory Memory (n=20) Mean±sd	**Visual Memory (n=20) Mean±sd**	**P value**
Males	10.75±2.1	12.3±1.84	<0.000***
Females	13.4±1.27	14.65±1.57	<0.001***
p value	< o.ooo***	<0.000***	

DISCUSSION

In the present study, visual memory (VM) was found to be statistically better than auditory memory (AM). Female subjects performed statistically significantly better than their male counterparts so much that females' (AM) was better than VM of male subjects although this difference was statistically insignificant .

Our findings were consistent with the findings of Elizabeth Hilton who worked on auditory memory and visual memory and found visual memory to be better. One of the reasons could be that auditory recording is very different from visual recoding. Visual stimuli are seen and heard through rehearsal mechanism in the brain while auditory stimuli were only heard, making that a more difficult process to perform. Auditory memory involves a four steps process: being able to take in the information that is presented orally, to process that information, store it in one's mind and then recall what one has heard. Basically, it involves the skill of attending, listening, processing, storing, and recalling whereas visual memory is a part of memory that applies to information we have retrieved using visual experience. The brain functions cognitively to create a mental image to illustrate the retention of detailed visual information. When the brain is processing a visual image, the cognitive functioning requires a mental image, but when the cognitive functioning is through the process of auditory

stimuli, the brain needs to hear the word and then create a 'mental image' for a correct recall. A possible problem could be the subject's perception, interpretation, or input problems like distractions from the environment where the processing is taking place [4, 7, 8].

One reason for poor auditory memory could be that a person has a tendency to remember the first and last few items being presented because the brain rehearses the information that was presented first and last, and have an inclination to forget the middle item [4].

Further, females showed statistically significantly better AM & VM in comparison to male subjects. In neuroimaging studies during neuropsychological task performance in temporal and parietal cortical areas in young and post menopausal women receiving estrogen treatment showed greater activation, increased blood perfusion and glucose metabolism in certain brain regions related with memory and other cognitive functions [9,10]. Estrogen is thought to have a facilitating effect on tasks of verbal memory in which women typically excel, such as articulation, speed and coordination. Role of estrogen can further be supported by studies conducted during mid luteal phase of menstrual cycle and women perform at a higher level on these tasks, when estrogen levels are high [11,12]. Sex differences in the corpus callosum are an established fact. In women, the back part of the corpus callosum is bigger than in men. [5].

This observation confirms the results of earlier studies by other authors. Earlier Kimura D has observed that men and women display patterns of behavioral and cognitive differences that reflect varying hormonal influences on brain development due to which women tend to perform better than men on tests of perceptual speed. Further, Kimura has said that major sex differences in function seem to lie in pattern of ability rather than in overall level of intelligence (measured as IQ). Although some researchers such as Richard et al have argued that there exists a small IQ difference favoring human males. Differences in intellectual pattern refer to the fact that people have different intellectual strengths and two individuals may have differing cognitive abilities within the same level of general intelligence. Sex difference in problem solving has been systematically studied in adults in laboratory situations .It has been observed that women on average, excel on tests that measure recall of words and on tests that challenge the person to find words that begin with a specific letter. Women perform better than men in both verbal memory (recalling words from lists or paragraphs) & verbal fluency (finding words that begin with a specific letter) [5].

Patricia A lowe et al conducted a study on gender differences in short term memory test performance on a nationally stratified sample of 1,279 children and adolescents and concluded that visuosequential memory loaded highest on spatial memory factor for females [13]. In studies related to navigation routes, men have shown results wherein they learnt the route in fewer trials with fewer errors, but women remembered more of the landmarks such as pictures of different types of buildings, sign boards etc than men did. Hence women may be using landmarks as a strategy in everyday life more than men do.[5].Gur et al and Elliotis have also speculated that in general ,females have more grey matter and males have more white matter.This high amount of white matter in males contributes towards better analytical skills and transfer of information to different regions of brain,thereby helping in problem solving capacity.[14,15,16]. In the present study though very neutral common stationary articles were used, still women performed better than men. This has been seen in earlier studies too wherein women tend to remember better, an object or a series of objects which have been displayed.

CONCLUSION

Hence the present study conducted on young males and females of Garhwal region on short term memory tests have shown better results for Visual Memory than Auditory Memory and further females have given better results than males for both Auditory Memory and Visual Memory. This would prove useful in further research on memory and cognition in this area.

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Comparison of Pulmonary Functions in Primi and Multigravida – A Cross Sectional Study

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ABSTRACT

Introduction: Aim of the study is to compare the lung function variables in primi and multi gravida

Materials and method: Pregnant women from the antenatal clinic of government hospital kilpauk medical college were selected for the study. The study group consists of 80 women of which 40 women were primi and 40 women were multi gravida. Pulmonary Function Tests were studied using computerised spirometer – "MEDSPIROR".

Result: Results were analysed using Students "t" test which showed all the parameters of lung functions were decreased in multiparous women when compared to primi. Of these PEFR, FEF 25-75, FEF 25%, FEF 75% show significant decrease in multigravida.

Conclusion: The lung functions variables were less in multigravida, when compared to primigravida. This could be attributed to advancing age, parity and declining nutritional status.

Keywords: *Pulmonary Function Test, PrimiGravida, Multigravida.*

INTRODUCTION

Pulmonary function Test is actually a series of tests that measure lung function. The tests provide information about the amount of air a person's lungs can hold, and how effectively the lungs work. They also look at the forcefulness of an individual breathing in clinical practice, it is used as pre-operative assessment in surgery, and is also used to assess the effects of medication and to measure the progress in disease treatment Normal values are based upon the age, height, ethnicity and the sex of the person being tested.

In our study, we aimed to assess the effects of pregnancy on lung functions tests. We performed pulmonary function tests on normal pregnant women between primi and multigravida of same age group for comparison.

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Ventilatory capacity is the maximal ability to move gas rapidly in and out of the lungs. It is influenced by the airway resistance, the vital capacity and a number of other physiological parameters. The measurement is influenced by procedural factors the extent to which the subject has practised the necessary manoeuvres

Spirometry is a simple method of studying pulmonary ventilation in which spirometer records the volume movement of air into and out of the lungs. Factors that determine a person's pulmonary function depends on physiological characteristics of the respiratory tract namely mobility of the lungs, chest wall and diaphragm, strength of the respiratory muscles and chest movements during Inspiration and expiration and environmental factors like occupation and nutritional status.

Lung volumes play a major role in the gas exchange and in the work of breathing. Lung volumes are determined by the balance between the lungs elastic recoil properties and the properties of the muscles of the chest wall. The use of computers to perform spirometry has accelerated in the past decades. Validated computerised

spirometry systems will simplify and enhance the measurement and interpretation of spirometry. The study of lung parameters during pregnancy would be useful, because pregnancy induces profound changes in the mother, resulting in significance alterations in normal physiology.

Studies by Robert et al[1] indicate that in pregnancy the interactions among the rib cage, abdomen and diaphragm are designed to defend against large changes in Functional Residual Capacity, when the abdomen is distended. He also concluded that the vital capacity is unchanged in pregnancy which due to the fact that the maximal external ribcage dimension at active lung capacity is greater with abdominal distention.

UshaMonga et al [2] in their study found that PEFR showed non significant decline in pregnancy.

A humoral factor alters the tracheobronchial smooth muscle tone so that pulmonary function is protected throughout pregnancy. Progesterone elevated in pregnancy influence the smooth muscle tone. Cugel et al[3] found that there was no significant change in FEV_1 / FVC. Similar findings were shown by Baldwin et al[4]

Prowse et al[5] have shown decreased airway resistance in pregnant women, a state of relative bronchodilatation speculated to be brought about by smooth muscle relaxing action of certain hormones namely progesterone, Relaxin and corticosteroids whose levels are increased in pregnancy. Progesterone may act as a respiratory centre stimulant.

MATERIALS AND METHOD

Instrument used in the study

The "MED SPIROR" was used for study. The medspiror is a computerized pulmonary function testing equipment. Information entered regarding subject's age, sex height, weight, date, temperature. Two maneuvers were used to record all test .

Forced vital capacity

Forced vital capacity (FVC) is the maximum volume of air that is breathed out by a rapid and complete expiration after a maximal inspiration. FVC is useful test to assess overall lung function. It is determined primarily by four factors (1) strength of the chest and abdominal muscles (ii) Airway resistance (iii) Lung size (iii) Elastic properties of the lung. Any condition that decrease the strength of the respiratory muscles (eg. Poliomyelitis) decreases the lung volume (eg. Tuberculosis), increases airway resistance (eg. Asthma or bronchitis) or conditions that make the lung stiffer will lead to significant decrease in FVC.

Maximal Voluntary Ventilation [MVV]

The ability to reach a high MVV depends on the muscular forces available, on the compliance of the thoracic walls and lungs and on the airway resistance set up, MVV is profoundly reduced in patients with emphysema or in patients with airway obstruction. This computerized instrument gives data regarding percentage of prediction and also two tracings of Forced vital capacity FVC, Maximum expiratory flow volume curve –MEFVC: Functional parameters studied are (i) Forced vital capacity (FVC) in litres; (ii) Forced expiratory volumes (a) $FEV._5$ in litres& FEV_1 percentage (iii) Maximal voluntary ventilation (MVV) in litres/min. (iv) Forced expiratory Flow Rates in litres/Sec. (a) Peak Expiratory Flow Rate(PEFR) (b) FEF at 25% of FVC ($FEF_{25\%}$) (c) FEF_{50} (d)FEF_{25-75} .We can readily measure FEV_1 and FEV_1/FVC ratio. These measurements by themselves provide a considerable amount of information about function ventilatory during normal and abnormal conditions.

Subjects:

Pregnant women from the antenatal clinic of Government Hospital, Kilpauk Medical college, were selected for this study. The study group consisted of 80 women, of which 40 women were primi, 40 women were multigravida. Those with no current respiratory signs or symptoms or no history of major respiratory illness were involved in this study functions. All recordings were made during 9 AM – 1 PM. Measurements of lung functions were made after demonstration and explanation of the maneuver to the subjects. Readings were recorded from the best of the three. Lung functions studied were FVC,FEV, PEFR,FEF_{25-75} $FEF_{25\%}$ $FEF_{50\%}$ $FEF_{75\%}$

Technique

The maneuver was explained to the subjects, as proper understanding and cooperation was essential to obtain correct values. The mouth piece was placed into the breathing tube. For FVC, the subject was instructed

to take a maximal inspiration, the mouthpiece was placed firmly in the mouth and she was asked to breathe out maximally and rapidly till she was unable to expire anymore through the mouth piece. The maneuver was performed 2 to 3 times and the best of the reading for FVC was accepted. All the readings were obtained with the subject in the standing position.

RESULTS

The mean values with their standard deviations of pulmonary function variables for the primi and multigravida are shown in Table 1. Students t-test was applied to test the statistical significance p valve <0.05 was accepted as statistically significant.

In our study, on analysing the data of primigravida and multigravida, we found that all the pulmonary functions test parameters were less in multigravida as compared to primi gravida.

Of these PEFR, FEF 25-75% $FEF_{25\%}$ $FEF_{75\%}$ show significant decrease in multigravida (P<0.05) Measures of large airway functions such as FVC and FEV were reduced during pregnancy both in primi gravida and in multigravida and not statistically significant between primi and multigravida. This is in accordance with the study of RupaMokkapati et al.[6] The reduction in large airway function especially FVC during advanced stages of pregnancy could be due to mechanical factors like enlarging uterus interfering with diaphragmatic excursions.

DISCUSSION

Pregnancy is a state of altered physiology. Remarkable physiological changes occur in maternal systems during pregnancy These changes are primarily meant to supply adequate oxygen and nutrients to foetus for its growth and development.

The preservation of FVC is associated with diminished abdominal compliance and augmentation of ribcage volume displacement. Other contributory factors are relative mobility of thoracic cage as well as unimpaired diaphragmatic movement despite progressive enlargement of gravid uterus.Das[7]

Measures of large airway functions such as FVC, FEV and PEFR were reduced during pregnancy. This is in accordance with the study of Rupamokkapatti et al.

The reduction in large airway functions especially FVC could be due to mechanical factors like enlarging uterus interfering with diaphragmatic excursions.

According to Madesh et al[8] vital capacity is lower during pregnancy than the non pregnant state

Phatak et al[9] in their study found no significant change in FEV_1 as during pregnancy, progesterone corticosteroids and relaxin cause certain degree of bronchodilatation due to relaxation of smooth muscle. Thus the mechanical disadvantage to the respiratory apparatus induced by advancing pregnancy is compensated by decrease in airway resistance and an improved airway conductance. Pandey et al [10]

In addition to these direct effects of pregnancy, the lung functions are also affected indirectly through the increased load which is placed upon the circulation, by the need to maintain an adequate flow of blood to the pregnant uterus.

Table No: 1 Comparison of Primi and Multigravida with its 'P' value and its significance.

Variables	Primigravida Mean ± SD	Multigravida Mean ± SD	P value	Significance
FVC	1.97 ± 0.27	1.90 ± 0.25	0.1229	Not significant
FEV_1	1.77 ± 0.23	1.68 ± 0.23	0.052	Not significant
PEFR	4.10 ± 0.84	3.72 ± 0.85	0.035	Significant
FEF-25 - 75	2.94 ± 0.45	2.71 ± 0.48	0.025	Significant
FEF 25%	4.07±0.68	3.71±0.75	0.026	Significant
FEF 50%	3.39 ± 0.58	3.11 ±0.81	0.065	Not significant
FEF 75%	1.95 ± 0.43	1.73 ±0.45	0.021	Significant

(p valve <0.05 was accepted as statistically significant)

FVC - Forced Vital Capacity; FEV_1-Forced Expiratory Volume in1 second;

PEFR – Peak Expiratory Flow Rate;

FEF_{25-75} – Forced Expiratory Flow at 25–75% of forced vital capacity;

$FEF_{25\%}$ - Forced Expiratory Flow at 25 % of forced vital capacity;

$FEF_{50\%}$ - Forced Expiratory Flow at 50 % of forced vital capacity;

$FEF_{75\%}$ - Forced Expiratory Flow at 75 % of forced vital capacity;

CONCLUSION

The lung functions variables are less in multigravida than primigravida. This could be attributed to advancing age, increase in parity and declining nutritional status in multigravida. Spirometric values though lower than predicted remained within physiological ranges through out pregnancy. Pregnancy both in primi and multigravida. The changes in pulmonary function during pregnancy are physiological and adaptive in nature. Inspite of the mechanical disadvantage to the respiratory apparatus, pregnant women are able to achieve adequate ventilation which facilitates foeto maternal gas exchange.

The multigravida women have to improve the nutritional status for the safe delivery of a healthy baby and further they have to adapt any family planning methods, to improve her quality of life for future.

Conflict of Interest - Nil

Funding – Self

Ethical Clearance - Obtained.

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A Case Control Study of Levels of Serum Magnesium and HbA1c among Patients with Type 2 Diabetes

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ABSTRACT

Introduction: Magnesium (Mg) deficiency is a common problem in diabetic patients. Deficiency of Mg may increase the incidence of diabetes mellitus (DM) and occurrence of diabetic complications.

Objective: To assess the serum magnesium and HbA1c levels in type 2 diabetes patients.

Method: This is a case control study and the sample size was 60 (30 type 2 diabetic patients and 30 controls). Serum magnesium levels and HbA1c were measured . Statistical analysis was performed using SPSS 16.0 (SPSS Inc., Chicago, IL, USA)

Results: The serum magnesium levels are significantly lower in diabetic patients when compared to controls ($P<0.001$) . There was a significant correlation between the diabetic status and low serum magnesium levels. The values of HbA1C (%) were positively correlated with blood glucose level and negatively correlated with serum magnesium levels.

Conclusion: Hypomagnesaemia is associated with micro vascular complications and poor glycemic control. It is important to regularly monitor magnesium levels in all type 2 diabetic patients.

Keywords: *Type 2 Diabetes mellitus, Insulin resistance, Magnesium.*

INTRODUCTION

Diabetes is expected to distress about 170 million people worldwide and this represents about 2% of the world's population [1, 2] . Magnesium is the fourth most profuse cation in the human body and the second most abundant intracellular cation. It is a main cofactor in a number of key enzymatic reactions and appears to play an essential role in glucose metabolism and insulin homeostasis. It plays a vital role in carbohydrate metabolism. It can affect the release and activity of insulin [3]. Blood levels of magnesium are reduced in individuals with type-2 diabetes. Hypomagnesaemia may exacerbate insulin resistance.

The kidneys perhaps lose their ability to retain magnesium during periods of severe hyperglycemia (considerably elevated blood glucose). The increased excretion of magnesium in urine could then result in lower blood levels of magnesium[4]. Magnesium reduction and Insulin resistance result in a vicious cycle of decrease in intracellular Mg2+ and worsening insulin[5]. It is not known whether difference in trace elements status is a result of diabetes and hyperglycemia or instead their reduced levels contribute to the pathogenesis of the disease. However, different studies have given conflicting results[6,7]. In current years, increasing verification has appeared suggesting an association between magnesium deficiency and type 2 diabetes mellitus (T2DM) [8–12].

Because of increasing prevalence of DM in India, with the well-known biochemical parameters we

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decided to search the association of serum magnesium in Type 2 Diabetes. In the present study we evaluated the serum magnesium and HbA1c in type-2 diabetes cases & controls.

MATERIALS AND METHOD

Patients of type 2 diabetes mellitus of age 40-70 years, in the Department of Medicine, Chittoor Government district Hospital from December 2015 to April 2016 were taken for this study considering the inclusion and exclusion criteria. Informed written consent was taken from all subjects and the study was approved by the ethics committee. Controls were compared to cases by gender, age and BMI. None of the participants had a positive clinical history of chronic or acute renal failure, malignancy, chronic diarrhea, alcohol intake. Subjects receiving magnesium supplementation or treated with drugs known to modify magnesium metabolism (such as calcium antagonist, diuretics, thyroxin, and lithium) were excluded from the study. No patient with type 1 diabetes was included and none of the women were pregnant. Total of 60 subjects were included in this study 30 type 2 diabetic cases and 30 controls between age of 40- 70years . According to earlier studies, hypomagnesaemia was defined as a serum magnesium concentration #0.75 mmol/L [12, 13, 14]. T2DM was defined according to the criteria recommended by the Expert Committee on the Diagnosis and Classification of Diabetes.

Height, body weight and body mass index (BMI), which was calculated with the formula weight/ heightsquare(kg/m2), were recorded for each patient. A venous blood sample was collected from each subject in the morning after 12-hour fasting, to evaluate fasting glucose [hexokinase with enzymatic reference methods]; Serum magnesium [Colorimetric end point methods with ksilidil blue], HbA1c [HPLC-high performance liquid chromatography- Biorad Variant II Turbo].

Statistical analysis was performed using SPSS 16.0 (SPSS Inc., Chicago, IL, USA). Student `t' test /Chi-square test has been used to find the significance of homogeneity of study characteristics between both groups of patients. Analysis of variance has been used to find the significance of study parameters between the groups. Results were expressed as mean + SD. Probability values of P< 0.05 were considered to indicate statistical significance.

RESULTS

The cases and controls were group matched according to age and sex. The male/female ratio of both cases and controls is 13:12. The mean age group of cases is 58.4±9.46 and for controls is 59.12±6.90 (Table 1). The serum magnesium levels are significantly lower in diabetic patients when compared to controls (P<0.001). Whereas, HbA1C was significantly higher in diabetic patients when compared to controls (P<0.001) (Table 2).

Table 1 Showing age and BMI of Diabetic patients and controls .

Para-meter	Status	Mean ± Std. Deviation	t	P
Age	Controls	59.120±6.9000	-.307	0.76
	Cases	58.400±9.4648		
BMI	Controls	22.47±2.21	4.377	.0001*
	Cases	25.57±2.75981		

Table 2 Showing Serum Magnesium levels and HbA1C (%) in cases and controls

Parameter	Subjects N=25	Mean Std. Deviation	t	P
Serum Magnesium (mmol/L)	Controls	2.08±.407	-8.110	.0001***
	Cases	1.32±.231		
BMI (kg/m^2)	Controls	22.47±2.21	4.377	.0001*
	Cases	25.57±2.75981		
HbA1C (%)	Controls	4.93 ± 2.50	5.337	.0001*
	Cases	8.98 ± 2.26		

Table 3 Showing Linear regression of Serum Magnesium with Diabetic status

CONSTANT	Un-standardized Coefficients		Standardized Coefficients	t	P
	Beta	Std. Error	Beta		
Diabetic Status	.723	.114	.723	6.358	.0001

There is very highly significant correlation between the diabetic status and lower serum magnesium levels (P<0.001) (Table 3). The HbA1C (%) values were found to be significantly higher in diabetic group. The values of HbA1C (%) were positively correlated with blood glucose level and negatively correlated with serum magnesium levels.

DISCUSSION

Hypomagnesaemia may be an independent risk factor for type II diabetes. Defective tubular reabsorption, diarrhea, intestinal malabsorption, shift of magnesium from ECF to bone can result in hypomagnesaemia. Magnesium acts as cofactor for many enzymes involved in carbohydrate metabolism. Also, there is a strong relationship between magnesium and insulin action. A reduction of magnesium in the cells increases insulin resistance [15,16] . Tyrosine- kinase an intracellular enzyme requires magnesium to let insulin to exert its blood-sugar-lowering effects. In several studies, daily oral magnesium supplementation significantly improved insulin sensitivity by 10 percent and reduced blood sugar by 37 percent [17,18].

The mechanisms by which T2DM causes low serum magnesium levels remain to be fully understood. It has been suggested that insulin deficiency or resistance can promote magnesium wasting at thick ascending limb of the loop of Henle [19,20]. Secondly, lower serum magnesium in obese type 2 diabetic patients may be because of reduced intestinal magnesium absorption secondary to lower fiber in diet and higher fat intake [21,22] .Diabetic autonomic neuropathy may also reduce oral intake and gastrointestinal absorption [19,20].

Also, we found diabetics with micro vascular complications had poorer glycemic control than diabetics without micro vascular complications. Previous studies showed that higher level of HbA1C increases risk for development of micro angiopathy and macro angiopathy in diabetics [23].

There are some possible limitations that should be taken into consideration in interpreting the results of our study. First, we did not measure intracellular magnesium content, a more sensitive indicator of magnesium balance[24]. Although, approximately only 1% of whole-body magnesium is found extracellularly, there is a good correlation between extracellular and intracellular Magnesium is estimated by nuclear magnetic resonance spectroscopy. Second, we have not explicitly evaluated dietary magnesium daily intake. Finally, only a selected population of morbidly obese subjects was included

CONCLUSION

Diabetes is responsible for the low magnesium levels which are risk factors for various cardiovascular and other complications. The supplementation of magnesium and proper exercise to maintain the weight are advisable to prevent the diabetes associated complications in the future.

Conflict of Interest : Nil

Source of Funding : Nil

Ethical Clearance: Institutional ethics committee

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Comparison of Treatment in Iron Deficiency Anaemia with Iron Alone Versus Iron Plus Protein Supplementation

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ABSTRACT

Purpose: To evaluate the role of protein supplements in addition to iron in the treatment of iron deficiency anaemia. **Materials and Method**: A prospective clinical trial on consecutive series of female patients diagnosed with IDA. Patients were divided into two groups. Group A received only iron while group B received iron and protein. Hematological parameters were checked at monthly intervals till four months. The data was entered and calculated for statistical significance. **Results**: A total of 100 patients were included and divided into two groups of 50 each. Group A showed lower and slow improvement while group B showed higher and rapid improvement of hematological parameters. **Conclusion** : Protein supplements along with iron is necessary for higher and faster correction of IDA.

Keywords: *Anaemia, iron deficiency, protein supplementation, hematological parameters.*

INTRODUCTION

Anaemia affects two million people across the world and nearly half of that is due to iron deficiency.[1] Iron deficiency anaemia affects the entire spectrum of population ranging from children to middle age to elderly.[2 -7] Moreover, women are more commonly affected than men by IDA .[8-9] Iron deficiency in women of child bearing age group has serious public health implications ranging from increased maternal mortality to preterm delivery and low birth weight.[10-11] The usual method of treatment of IDA is by prescribing iron tablets only without giving any protein supplement. While iron is essential for formation of haem, globin is composed of protein. Therefore it is logical to assume that iron along with protein is necessary for the formation of hemoglobin. The lack of any component will lead to deficiency in formation of hemoglobin and there by inability to adequately correct IDA. It is to correct this lacuna in the treatment of IDA that a study was planned to put forward an optimal guideline for its comprehensive management

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MATERIAL AND METHOD

The present study was done at a Geetanjali Medical College and Hospital Udaipur, Rajasthan, India. All the females attending the medicine outdoor department in the age group of 18-35 years and diagnosed as IDA were included in the study. Females who were pregnant, lactating, nursing, or with clinical features of anaemia other than iron deficiency were excluded. All the eligible patients were explained about the details of the study and written informed consent was requested. A total of 100 patients were selected from those who fulfilled the eligibility criteria and agreed to participate in the study on first come-first serve basis. All the eligible patients underwent complete blood count (CBC), hemoglobin, hematoccrit, serum iron and total iron binding capacity (TIBC). Then they were randomly divided into two groups (A and B) and subdivided further into three groups(I,II and III) according to severity. Group A were treated only with iron tablets 350 mg(Selofer, Osho Pharma) once a day. Group B were treated with iron tablets 350 mg (Selofer, Osho Pharma) once a day in addition to protein supplement prepared from 200 grams

of pulses, grams and peanuts once a day. The treatment continued for 4 months during which blood tests were repeated at monthly intervals. The data were entered in statistical software(SPSS Inc, Chicago,IL,USA) and results were statistically analysed. $P < 0.05$ was considered significant.

RESULTS

A total of 100 patients were examined of whom the minimum age of was 19 years and maximum was 43 years (mean age 32.4 years). The patients were divided into two groups of 50 each. The distribution of patients in different groups and subgroups according to hemoglobin,hematocrit serum iron and TIBC is shown in tables 1,2 3 and 4 respectively.

Table-1: Distribution of patients according to hemoglobin levels .

Subgroups	Hemoglobin (grams%)	Group A	Group B
I	<7.0	18	19
II	7.0-8.9	29	27
III	9.0-11.9	03	04

Table-2: Distribution of patients according to Hematocrit

Subgroups	Hematocrit (%)	Group A	Group B
I	<25	18	19
II	25-30	29	27
III	>30	03	04

Table-3: Distribution of patients according to serum iron

Subgroups	Serum iron (mcg/dL)	Group A	Group B
I	<30	16	18
II	30-35	31	29
III	>35	03	03

Table-4: Distribution of patients according to TIBC .

Subgroups	TIBC(mcg/dL)	Group A	Group B
I	>250	17	18
II	200-250	30	28
III	<200	03	04

The mean values of Hemoglobin, Hematocrit, Serum Iron and TIBC in different subgroups recorded at monthly intervals is depicted graphically in Figures 1,2 3 and 4 respectively.

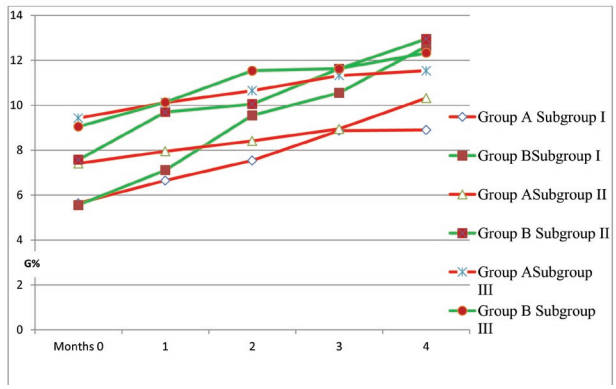

Figure 1: The Mean Hemoglobin recorded at monthly intervals. Group A is shown in red and group B in green lines.

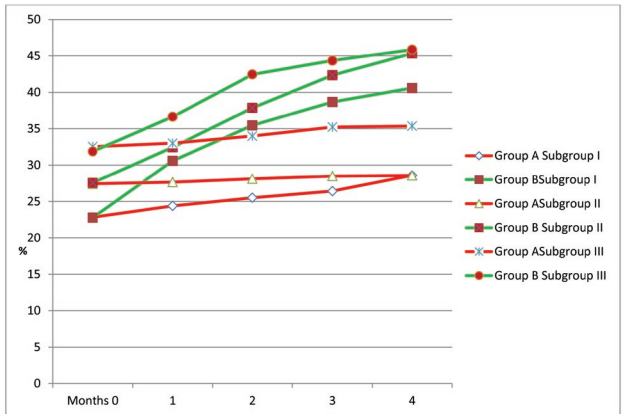

Figure 2: The Mean hematocrit recorded at monthly intervals. Group A is shown in red and group B in green lines

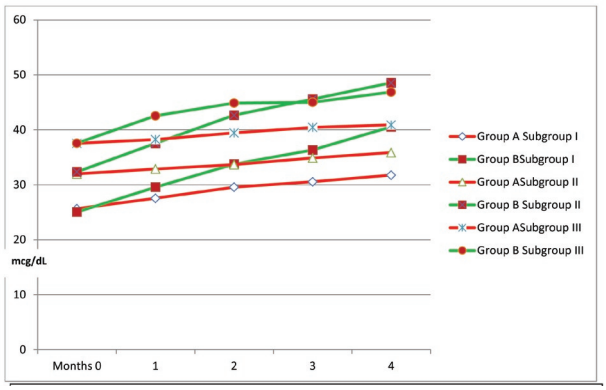

Figure 3: The mean serum iron recorded at monthly intervals. Group A is shown in red and group B in green line.

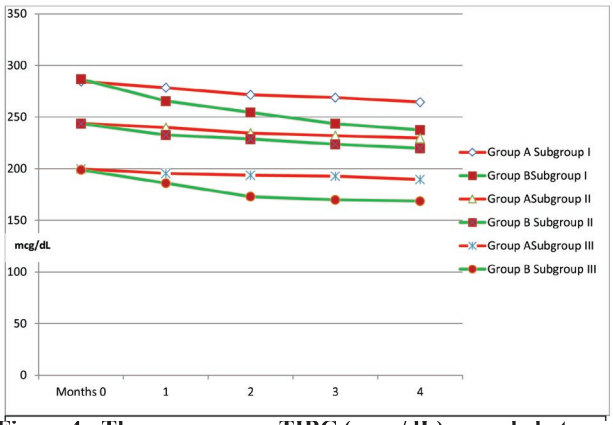

Figure 4: The mean serum TIBC (mcg/dL) recorded at monthly intervals. Group A is shown in red and group B in green lines.

Mean Hemoglobin recorded at monthly intervals. Group A is shown in red and group B in green lines.

The mean increase in hemoglobin (g%) at 4 months in subgroups I , II and III of group B was higher than in group A (7.06, 5.38 and 3.28 vs.3. 26, 2.91 and 2.11 respectively,p <0.05). The mean increase in hematocrit (%) at 4 months in subgroups I , II and III of group B was higher than in group A (17.81, 17.79 1nd 13.99 vs. 5.75,1.15 and 2.82 respectively,p <0.05). The mean increase serum iron (mcg/dL) at 4 months in subgroups I , II and III of group B was higher than in group A (15.49,16.2 and 9.31 vs. 6.11 ,3.87 and 3.35 respectively,p <0.05). The mean decrease in TIBC mcg/dL) at 4 months in subgroups I , II and III of group B was higher than in group A (-49.11, -23.82 and – 30.21 vs. -19.88, -14.12, and – 10.18 respectively, p <0.05). It was also observed that slope of the mean change curves at months 1 and 2 was steeper in group B than in Group A which tended to flatten at months 3 and 4 .

DISCUSSION

The lack of dietary iron is widely considered as the cause of IDA.[2,5,6,8,9] Not only individual physicians but even government programmes such as National Nutritional Anaemia Control Programme and Integrated Child Development Services scheme focus predominantly on iron supplementation for anaemia prevention .[12-14] On the other hand , there are only scarce reports which show protein deficiency as a cause of anaemia.[15-17] This may be the reason for widespread acceptance of treatment with iron only while avoiding the protein supplements.

But this practice of treatment is entirely unscientific unless the patient is aware of the dietary sources of protein . Such a high degree of awareness is not found in Indian population and they tend to miss on protein part of the diet. As a consequence, increase of hemoglobin is slow and insufficient which has also been shown by our study.

It is well established that hemoglobin, hematocrit, serum iron and TIBC correlate with severity of anaemia. [18] and hence these parameters were used in our study.

In our study, the patients on protein supplements along with iron achieved higher levels of hemoglobin, hematocrit, and serum iron as compared to iron alone.These higher levels achieved were statiscally significant (p<0.005) Not only this, the rate of increase of these parameters was faster in initial months on protein supplements plus iron. The rate of rapid increase in initial months could be attributed to the higher absorption from gastrointestinal tract during deficiency states . As the iron deficiency improves over initial months , the rate of further increase in hematological parameters gets slowed down. This could be explained by the lower absorption from gastrointestinal tract during the later months. Serum TIBC , an important marker of iron deficiency correlates well with other parameters. TIBC is decreased as iron deficiency improves and this was also observed in our study.

Apart from hematological parameters, IDA is also known to affect non hematological parameters . In iron deficiency various manifestations such as reduction of physical endurance, impairment of immune response, difficulty in regulation of temperature, alteration of energy metabolism, reduction of cognitive performance, and behavioral disturbances are well known.[19-.21] It has been found that treatment of iron deficiency normalizes cognitive function in women. [22]

Recently some new new parameters have been associated with IDA which may unravel the mystery of its pathogenesis in future. Polymorphisms in multiple genes have been found to be responsible for individual differences of iron regulation, more often in case of dietary iron challenge.[23] Also, higher levels of α_1-Acid Glycoprotein (AGP) has also been implicated in anaemia.[24] Interstingly, total iron intake and serum iron levels have been shown to exert a preventive effect on coronary and heart disease, while only haem iron

intake increased their risk. [25]

The limitations of our study are small size, inclusion of only females and of specific age group and short duration of follow up. Therefore a large case control study of longer duration is recommended .

CONCLUSION

For better and faster correction of IDA, protein supplements in addition to iron are highly recommended.

Conflict of Interest – Nil

Sources of Support- Nil

Ethical Clearance – By institutinal ethical committee.

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Effect of Caffeine on Cardiorespiratory Parameters in Sedentary, Healthy Young Females

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ABSTRACT

Background: In today's highly competitive life, most of the population is under pressure for better performance. The increment in performance depends upon various ergogenic methods to enhance the energy delivery system. Of various ergogenic methods available, caffeine consumption is increasingly popular amongst them.

Aims and objectives: The present study was undertaken to study the effect of caffeine (6mg/kg body weight) on cardiovascular & respiratory parameters after 5 minutes of stationary cycling on a bicycle ergometer, in sedentary young females of age 18-26 years.

Materials and Method: The participants were made to complete a graded exercise protocol on a bicycle Ergometer. The following parameters were measured, Systolic BP (SBP) in mm Hg, Diastolic BP (DBP) in mm Hg, Mean Arterial Pressure (MAP) in mm Hg, Maximum heart rate in beats per minute (bpm), Target heart rate (THR) in beats per minute (bpm), Double product of HR & SBP, Respiratory rate (RR) per minute, maximum volume of oxygen consumption by body in each minute during exercise (VO_{2max}) in ml/kg/min. At the end of 5 minutes (i.e. during recovery period), subjects PHR 1, PHR 3, PHR 5 was measured. After 2 days of first session, the same participants were given caffeine anhydrous powder in a dose of 6mg/kg of body weight, one hour prior to exercise session and after 5 minutes of exercise session, the above mentioned parameters were measured. All the mentioned parameters before and after caffeine consumption were compared using Paired t- test.

Results: There was statistically significant increase in systolic blood pressure, diastolic blood pressure, mean arterial pressure, target heart rate, double product of heart rate and systolic blood pressure, in respiratory rate, PHR 1, PHR 3, PHR 5 and significant decrease in $VO_{2max,}$ after one hour of caffeine consumption with exercise in all female participants.

Conclusion: Present study suggests that ingestion of caffeine (6mg / kg body weight) prior to a short term exercise has an ergogenic effect in a normal young females of age 18-26 years.

Keywords: *caffeine, submaximal exercise, cardiopulmonary parameters, $VO_{2max.}$*

INTRODUCTION

Cardiorespiratory & muscular endurance is improved by performance of exercises.[1] Submaximal exercise testing is an effective way of evaluating cardiorespiratory fitness (CRF) and in developing individualized exercise programmes,[2] as test administrators requires less training and exercise intensity is also realistic. Cycle ergometer is a preferred mode of testing, as CRF is usually well tolerated by individuals with physical limitations and allows selection of precise workrates. After reaching the optimal level of performance according to genetic makeup, the subsequent increment in performance depends upon various ergogenic methods to enhance the energy delivery system.[3] [4]

Caffeine is a widely used ergogenic substance today. Several studies have reported an enhancement of prolonged submaximal exercise after caffeine ingestion.[5] Caffeine acts as a central stimulant. It enhances alertness

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& vigilance, dampens pain perception and delays sleep .[6, 7, 8]

MATERIALS AND METHOD

The study was conducted in the Department of Physiology in a tertiary hospital in city of Mumbai after approval by the ethics committee.

75 normal, healthy, working females of 18-26 years of age were randomly selected from a Medical college in Mumbai.

CRITERIA FOR SELECTION OF SUBJECTS:-

INCLUSION CRITERIA:

- Age between 18-26 years.
- Healthy, working.
- Non-regular caffeine users (less than 2cups of coffee or equivalent /week).
- Non - athletes.

EXCLUSION CRITERIA:

- Age less than 18 or more than 26 years.
- Obese individuals.
- Smokers and alcoholics.
- Regular caffeine users (ingesting ≥ 300mg caffeine / day).
- Performing more than 20 minutes of exercise on 3 or more / week.

The nature of work of participants was basically of sedentary type. Procedure was explained and written consent was obtained, followed by detailed history and systemic examination of the subjects. Subjects were divided into 2 groups; Control group (group A):30 females and study group (group B): 45 female participants. The control group was asked to exercise on the bicycle ergometer only during the first visit and were not given caffeine for consumption. The study group were examined twice, once before caffeine consumption along with the control group and second time when they were given caffeine anhydrous powder in a dose of 6mg/kg of body weight during their second visit.

The following anthropometric parameters were studied

Age: was recorded from birthday by calendar to the nearest of year (<6months and >6 months)

Height: It was measured in cm, with the help of height measurement stadiometer.

Body Weight: It was measured in kg, by portable human weighing machine.

Body mass index: Was calculated by the formula BMI = Weight (in Kg) / Height (in m^2)

Body fat percentage is measured by Bicycle Ergometer. There was no significant difference in the control and study group for age, height, weight and BMI.

The subjects were then asked to perform exercise on bicycle Ergometer (Upright Bike 9380u Most Perfectly Ent Co. Ltd., Taiwan). The first session was to familiarise the participants and required them to complete a graded exercise protocol on a bicycle Ergometer in order to determine the power output required to elicit a THR, equating to 55% of individual age predicted maximum HR (220 - age).[9] Once the THR is attained, the participant was instructed to continue to cycle at the power output, that equated to this HR value for a duration of 5 minutes. The subject pedalled the bicycle at the rate of 60 revolutions/minute. After 5 minutes of exercise session, following parameters were measured.

Parameters studied:

Systolic BP (SBP) in mm Hg , Diastolic BP (DBP) in mm Hg, Mean Arterial Pressure (MAP) in mm Hg: MAP = 1/3 (SBP - DBP) + DBP, Maximum heart rate in beats per minute (bpm), Target heart rate (THR) in beats per minute (bpm), Double product of HR & SBP, also called Myocardial-Tension-Time (M.T.T.) which gives an index of myocardial oxygen consumption, Respiratory rate (RR) per minute, Maximum volume of oxygen consumption by body in each minute during exercise (VO_{2max}) in ml/kg/min by the following formula VO2max = 111.33 – (0.42 × THR in bpm). [10] At the end of 5 minutes (i.e. during recovery period), their pulse rate was measured at the end of 1 minute , 3 minutes , 5 minutes. There was no significant difference in the above mentioned cardiorespiratory parameters in the control group and study group.

After 2 days of first session only the study group (group B) participants were called and given caffeine anhydrous powder in dose of 6mg/kg of body weight & instructed to ingest it with water in front of the investigator. After the rest period of 1 hour, the exercise session as performed during the first visit was carried out. After 5 minutes of exercise session, above mentioned parameters were measured.

OBSERVATIONS

Table 1 indicates the anthropometric parameters in female participants.

Table 2&3 illustrates mean values of cardiovascular parameters and Double product of heart rate and systolic blood pressure among study group female participants before and one hour after caffeine consumption with exercise. There was a statistical significant increase in all cardiovascular parameters, SBP, DBP, MAP, THR and Double product of HR & SBP after caffeine consumption

Table 4 shows the mean values of Respiratory parameters before and one hour after caffeine consumption with exercise among study group female participants. There is a significant increase in RR and significant decrease in VO_{2max} after caffeine consumption.

Table 5 illustrates the mean values of PHR 1, PHR 3, PHR 5 before and one hour after caffeine consumption with exercise among female participants which showed a statistically significant increase in all.

RESULTS

TABLE 1: Anthropometric parameters in females

	females (N=45)	
	Mean	**S.D.**
Age (years)	20.58	3.872
Weight (kg)	54.00	13.545
Height (cm)	160.33	6.372
BMI (kg/m^2)	20.95	5.078
Body Fat (%)	22.66	7.564

TABLE 2 Comparison of mean values of cardiovascular parameters before and one hour after caffeine consumption with exercise among female participants

Variable		Mean	S. D.	Paired t- test	P value
SBP (mm Hg)	Before	130.00	7.72	3.086	0.002
	After	140.00	4.68	Difference is significant	
DBP (mm Hg)	Before	71.00	5.68	2.966	0.013
	After	74.00	5.87	Difference is significant	
MAP (mm Hg)	Before	90.89	5.59	4.811	0.001
	After	97.39	4.51	Difference is significant	
THR (bpm)	Before	130.42	9.28	4.634	0.001
	After	144.17	7.23	Difference is significant	

TABLE 3 Comparison of mean values of Double product of heart rate and systolic blood pressure before and one hour after caffeine consumption with exercise among female participants

Variable		Mean	S. D.	Paired t- test	P value
Double product of HR & SBP	Before	16,973.33	1,771.75	5.984	0.000
	After	20,403.83	1,292.56	Difference is significant	

Table 4: Comparison of mean values of Respiratory parameters before and one hour after caffeine consumption with exercise among female participants

Variable		Mean	S.D	Paired t- test	P value
RR (/min)	Before	26.00	7.00	6.917	0.000
	After	32.00	6.92	Difference is significant	
VO2max (ml/kg/min)	Before	56.55	3.90	4.632	0.001
	After	50.78	3.04	Difference is significant	

Table 5: Post-exercise heart rate (PHR) consumption with exercise among female participants

Variable		Mean	S. D.	Paired t-test	P value
PHR 1 (bpm)	Before	121.33	17.70	2.384	0.036
	After	131.33	11.52	Difference is significant	
PHR 3 (bpm)	Before	108.92	17.87	2.625	0.024
	After	119.50	12.73	Difference is significant	
PHR 5 (bpm)	Before	103.25	13.21	**2.573**	**0.026**
	After	112.42	12.04	Difference is significant	

DISCUSSION

In the present study there was a statistically significant increase in all the cardiovascular parameters that is, Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean Arterial Pressure (MAP), Target Heart Rate (THR), Double Product of HR & SBP, after 5 minutes of stationary cycling on bicycle ergometer in normal young females of age 18-26 years. Similar findings have been reported by authors who studied the effect of caffeine on cardiopulmonary parameters. [10, 11] Also no difference in blood pressure and heart rate in caffeine users have also been reported.[12]

Caffeine increases SR Ca^{+2} permeability, thereby increasing $(Ca^{+2})_i$ which then (via Ca^{+2} – induced Ca^{+2} release) promotes the release of more Ca^{+2} from SR. [13.] Caffeine and other methylxanthines have known to exert a positive inotropic effect on cardiac muscle by various mechanisms like increase in cyclic adenosine monophosphate levels via inhibition of phosphodiestrase, by caffeine induced release of calcium from the sarcoplasmic reticulum, antagonism of endogenous adenosine receptors causing a progressive rise in vascular resistance and increase in sympathetic activity. [14]

Double product of heart rate and systolic BP, also called myocardial-tension-time index (M.T.T.I), gives an index of myocardial oxygen consumption. [15, 16, 17] It is an accepted index of left ventricular oxygen consumption and a substantial measure of work load of the heart. There was statistically significant increase in it, which may be due to increase in hormonal levels of epinephrine and norepinephrine, increase in total peripheral resistance, increase in stroke volume resulting in increased cardiac contractility and vasoconstriction.

There was a statistically significant increase in respiratory rate (RR) after caffeine ingestion which may be due to central nervous system stimulation which augments the central inspiratory drive and increases chemoreceptor sensitivity to carbon dioxide. At cellular level, xanthines block phosphodiesterases, promoting cAMP accumulation. CNS is stimulated and responds with a regularized breathing pattern, increased ventilatory drive, increased chemoreceptor sensitivity to carbon dioxide. [18]

There was a significant decrease in VO2max in all the participants after one hour of caffeine consumption with exercise. Various studies have found significant increase and decrease in VO_{2max} after 1 hour of caffeine consumption with submaximal exercise testing. [19, 20, 21, 22] O_2 delivery to the active muscles appears to be the limiting factor in muscle performance. VO_{2max} varies with the level of physical conditioning and regular exercise

increases its capacity to deliver and utilise O_2 to the active muscles. Training progressively increases $VO_{2max.}$ With long-term training, capillary density in skeletal muscle increases and so do the number of mitochondria and oxidative enzymes in them. In addition, levels of ATPase activity, myoglobin, and enzymes involved in lipid metabolism also increase. [23]

Though various studies have revealed increase in VO_{2max} after caffeine consumption indicating caffeine to act as an ergogenic aid. However the decrease in VO_{2max} 1 hour after caffeine consumption with exercise in our study indicates caffeine does not have an ergogenic effect on VO_{2max}. Thus caffeine does not appear to be ergogenic during short-term exercise. Training status may also pay a role in eliciting exercise performance benefits associated with caffeine ingestion. Majority of studies that have reported significant improvement in exercise performance following caffeine ingestion involved well-trained athletes, whereas effect of caffeine may be different in a non-athletic population. In trained athletes, the adaptive physiological changes that occur may be due to greater responsiveness or sensitivity to caffeine uptake. [24]

There was statistically significant increase in PHR 1, PHR 3, PHR 5 in female participants after one hour of caffeine consumption with exercise. This may be due to the combination of parasympathetic withdrawal and sympathetic activation. The fall in heart rate immediately after exercise is considered to be due to reactivation of parasympathetic nervous system. Recovery of heart rate that is seen immediately after exercise is a function of vagal reactivation. [25]

CONCLUSION

The present study shows that caffeine (6mg / kg body weight) ingestion prior to a short term exercise has an ergogenic effect by making appropriate changes in mentioned cardiovascular & respiratory parameters in a normal young females of age 18-26 years.

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Conflict of Interest: Nil

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