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Effect of Anemia on Audiovisual Reaction Time in Adolescent Female of 17-19 Years

Anita Kumari[1], Anju Kumari[1], Keerti Mathur[2], Pooja Sakshi [1], Swati Sinha[1], Ashok Sharan[3]

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ABSTRACT

Objectives: There is high risk of development of anemia in adolescent girls because of increased iron demands during puberty, menstrual losses, and limited dietary iron intake. Reaction time is a measure of function of sensorimotor association and performance of an individual. This study was carried out to demonstrate the effects of Anemia on Audiovisual reaction time in adolescent female

Material and method: Adolescent Females between 17-19 years of age with similar socioeconomic background were recruited from undergraduate medical students. They were all screened and categorized into two groups depending on their haemoglobin status. Students having Hb ≥12 gm/dl formed the control group i.e. Group I (n=30). All students having Hb <12 gm/dl formed group II i.e. anemic (IDA) group. Hemoglobin estimation in gm/dl was done by Sysmex FS 3000 Autoanalyser. Auditory and Visual reaction time were measured by indigenously prepared software in computer programming language Visual Basic 6.0.

Results: The mean Hb levels in Group I was 12.623±0.5557 and Group II was 10±0.4347 (P<0.001). The difference in auditory and visual reaction time between two groups was found to be significant (P<0.001).

Conclusion: Both ART and VRT were significantly increased (P<0.001) in anemic having hemoglobin <12gm% as compared to those having hemoglobin ≥12gm% suggesting decreased sensorimotor performance in anemics.

Keywords : *anemia, reaction time, auditory, visual.*

INTRODUCTION

Using WHO threshold values for Hb concentration, a meta-analysis of a large number of studies suggests that 30% of the world's population is anemic[1], whereas studies in India show that 65% infant and toddlers, 60% 1-6 yrs of age, 88% adolescent's girls and 85% pregnant women are anemic[2].

Nutritional anemia is a disorder characterized by the inadequate production of hemoglobin or erythrocytes caused by deficiency of iron, folic acid, vitamin B_{12} as well as proteins, trace elements(zinc, cobalt, copper), vitamins C and A, riboflavin.

Iron is required for many essential bodily functions, including oxygen transport, ATP production, DNA synthesis, mitochondrial function, and protection of cells from oxidative damage[3]. It is also necessary for normal myelination[4], neuronal metabolic activity[5], and synthesis of neurotransmitters (dopamine, serotonin, GABA). The average concentration of iron in the brain is far higher than that of all other metals, except zinc.

Of all the nutritional deficiencies, iron deficiency anemia is a major public health problem in India. It is pervasive and affects all age-sex groups but the most severely affected are women in the reproductive age group and young children. It induces generalized as well as systemic health consequences, the important one being irreversible brain dysfunction[6]. Adolescent girls are at the highest risk of developing anemia, especially

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iron deficiency anemia (IDA), because of their greater physiologic requirements, combined with increased menstrual losses and poor dietary intake[7].

Reaction time is a measure of function of sensorimotor association[8] and performance of an individual[9]. It has physiological significance and is a simple and non-invasive test for peripheral as well as central neural structures[10].

The measurement of auditory (ART) and visual reaction time (VRT) has been used to evaluate the processing speed of central nervous system and co-ordination between the sensory and motor system[11]. The reaction time is also affected by mood, memory, psychological state, stress, and first time performance and behavioral and mental attitude of the individual[12].

Many studies have shown altered transmission in auditory and visual systems in infants and children with iron deficiency[13,14], but similar measurements are lacking in adolescents suffering from anemia.

So, the present study was undertaken to study the effects of anemia on auditory and visual reaction time in adolescent females.

MATERIALS AND METHOD

The study was conducted in the Upgraded Department of Physiology, Sawai Man Singh Medical College, Jaipur from October 2011 to September 2012.

Apparently healthy adolescent girls between 17-19 years of age and belonging to similar socioeconomic status were selected for the study from the undergraduate medical students. They were all screened and categorized into two groups depending on their hemoglobin status. Students having Hb > 12 gm/dl formed the control group i.e. Group I (n=30). All students having Hb < 12 gm/dl formed group II i.e. anemic group.

Females with history of any acute/chronic disease/ infection, physical/mental illness, genetic disease, hearing or visual disorder, haemolytic anemia, history of blood transfusion, receiving iron supplementation within 1 month were excluded from the study.

The subjects were briefed about the study protocol and informed consent was taken. The clearance from the ethical committee of the institution was taken for the study. Age and anthropometric parameters were noted.

The study was done during the Post menstrual phase of the menstrual cycle to avoid any alteration in their values due to menstrual phase[9]. The recordings were conducted at the same time of the day in the morning, about 2 hrs after light breakfast.

Haematological Parameters:

The haematological parameter investigated was Haemoglobin content by Sysmex FS 3000 autoanalyser.

Recording of Sensory Motor Functions :

Visual Reaction Time and Auditory Reaction Time were measured by Reaction Time Software. The visual stimulus consists of coloured square that flashes in the center of the screen. The auditory stimulus consists of a computer generated beep of 3000 Hz / 200 msec, presented via a headphone to both ears. The frequency and duration of the stimulus were kept constant over sequential trials but the duration between two beeps varied randomly in order to prevent bias arising from prior anticipation.

Procedure:

All the subjects were subjected to ART and VRT recording in a quiet room in the Department of Physiology, SMS Medical College, Jaipur. The subjects were asked to sit in front of the computer screen and to put the index finger of their dominant hand lightly on the “Enter” button of the keyboard of the computer. They were asked to press the “Enter” button as quickly as possible when a visual or auditory stimulus was presented to them. Three consecutive readings of each stimulus were recorded. The lowest reading was taken as reaction time.

Statistical analysis: All results were expressed in Mean±S.D. For both the groups, Mean and Standard Deviation of all parameters were calculated according to accepted statistical methods. Intergroup mean differences for various parameters were tested for significance using students unpaired ‘t’ test. Correlation between hemoglobin and reaction time was done using Pearson’s Correlation Coefficient. Data was analysed with the aid of appropriate software.

RESULTS

There was no statistical difference between the age, height, weight and BMI of the two groups and hence

they were comparable for the study (Table 1).

Table 2 shows haematological values of the two groups. The mean haemoglobin level was 12.623±0.5557 in control group and was 10±0.4347 in group II.

TABLE NO. 1: Age, Anthropometric data and Body Mass Index (BMI) in Group I and Group II

PARAMETERS	Group I (Control) (n=30)	Group II (Anemic) (n=30)	P value
AGE(yrs)	18.33±0.497	18.26±0.52	P>0.05
HEIGHT(cm)	153.3±3.2286	153.37±3.1347	P >0.05
WEIGHT(kg)	48±4.0086	47.9±3.02119	P>0.05
BMI(kg/m²)	20.397±1.1512	20.352±0.8566	P>0.05

The differences between the two groups were not statistically significant.

TABLE NO. 2: Hemoglobin level in Group I and Group II

PARAMETER	GROUP I(Control)	GROUP II(Anemic)	P value
Hb(gm/dl)	12.623±0.5557	10±0.4347	P<0.001

P<0.001 - Highly significant.

In the present study, group II anemic adolescents showed a significant increase in ART (247.61±13.395 msec) when compared to control group I (194.28±14.688 msec).Similarly VRT was also more in Group II anemic (236.84±30.24 msec) as compared to the Group I control (209.08±12.00 msec)and the difference was highly significant P<0.001.

TABLE NO. 3: Auditory and Visual Reaction Time in Group I and Group II

PARAMETER	GROUP I (Control)	GROUP II (Anemic)	P value
ART(msec)	194.28±14.688	247.61±13.395	P<0.001
VRT(msec)	239.11±8.21	262.64±21.741	P<0.001

P<0.001 Highly Significant

Further, a significant negative correlation (Table 4) of haemoglobin was observed with both auditory and visual reaction time.

TABLE NO. 4: Correlation of Hemoglobin with Reaction Time in Group I and Group II

PARAMETERS	GROUP I (Control)	GROUP II (Anemic)
ART (msec)	-0.083	-0.653**
VRT (msec)	-0.039	-0.898**

** Highly significant

DISCUSSION

Reaction time (RT) means time taken by an individual to react to external stimulus. The increase in RT indicates an impaired sensory-motor performance. RT measurement is a sensitive and reproducible test and it can be done with simple apparatus and set up[9].

Both Auditory and Visual reaction time were found to be prolonged in the present study in anemic adolescents as compared to normal adolescents. Similar results have been derived in many of the earlier studies.

In a report published by World Health Organization (2004), Stoltzfus et al noted Iron deficiency (ID) as the single most common and highly preventable nutritional deficiency in the world. It was a major cause of anemia, affecting more than 2 billion people world-wide[15].

Significant improvement in IQ, concentration, speed of information processing and memory was noticed after partial correction of anemia in patients treated with recombinant human erythropoietin[16].

Yehuda et al[17] reported improved memory, attention, mood and energy in subject receiving iron for IDA before any improvement in Hb indices.

In a study on Iron deficiency and brain, Agarwal in 2001 noted that iron deficiency anemia in infants and children was associated with impaired growth and development, low development scores, poor mental performances and cognitive function. Among adolescent it was associated with poor performance in academic tests, reduced physical activity and implications for the long term health of their offspring[18].

Leis et al[19] in a case report suggest the mechanism for the underlying weakness in severe anaemia- a relative depression of the spinal motoneuron excitability, precipitated by spinal cord ischaemia.

In a recent study done on young women, Murray et al[20] showed that iron administration leads to an improvement in performance and the time taken to complete the reaction time task.

Dopaminergic neurotransmission has specific roles in circuits involved in transmitting visual and auditory information[21]. Dopamine is involved in memory, learning and attention as well as in motor control, hormonal regulation, stress responsivity, addiction and emotional affect[22].

In our study, a significant negative correlation of haemoglobin was observed with both auditory and visual reaction time.

Anemia produces generalized weakness and fatigue because of decreased tissue oxygenation. These symptoms along with other symptoms of anemia such as tiredness, poor concentration, poor attention and irritability could be the reason for prolongation of ART and VRT. Ballin and colleagues noticed that adolescent treated with iron reported decreased lassitude, improved mood and ability to concentrate[23].

CONCLUSION

Alteration of neurotransmission systems, hypomyelination of neurons, and decreased neuronal metabolic activity, delayed maturation of neural interactions among different sensory modalities might be responsible for prolongation in auditory and visual reaction time in anemic individuals and act synergistically to induce altered function.

Conflict of Interest: None

Source of Funding: Self

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An Association of Body Mass Index & Hypertension with Type II Diabetes Mellitus

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ABSTRACT

Background: The hypertension and Diabetes are common health problem in India. The aim of the present study was to evaluate the association of BMI and hypertension with type II diabetes mellitus.

Material and Method: 200 type II diabetic subjects were included in the present study. FBS, PPBS done by GOD/POD enzymatic method & HBA1C by ion exchange resin method in the laboratory. Height, weight and basal metabolic index were recorded by standard method. Blood pressure was recorded by Blood pressure was measured and classified as per the Seventh Report of the Joint National Committee, Geneva, Switzerland. Analysis was done by SPSS software. Blood

Result: out of 200 subjects 150 were male & 50 were female. 17% case had good & 83% had poor glycemic control. 51% were hypertensive, 10% were in the prehypertenion stage & 39 % had normal blood pressure

Conclusion: This study shows that increased prevalence of hypertension with type II diabetic patients. So early modification of lifestyle, diet, exercise & treatment of diabetes mellitus plays important role to decrease its prevalence

Keywords: *Type II diabetes mellitus, Hypertension, Body mass index*

INTRODUCTION

The term diabetes mellitus (DM) refers to a group of metabolic disorders characterized by chronic hyperglycemia.[1] These disorders usually result from defects in insulin secretion, insulin action or both.[2, 3] Sustained hyperglycemias is associated with complications in the macro vasculature, microvasculature and nerves, causing protracted morbidity and premature mortality.

Many patients with this form of diabetes are obese, and obesity itself causes some degree of insulin resistance. The risk of developing this form of diabetes increase with age, obesity and lack of physical activity[4]

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Hypertension is twice as common in diabetics as compare to non-diabetics[5]. The cause of hypertension may be multifactorial, obesity & hyperinsulininemia.

The increased atherosclerosis risk in DM is attributed to the high prevalence of several predisposing factors like obesity & hypertension[6]. These are modifiable risk factors. Decreasing hyperglycemias prevents or delays the onset and reduces the severity of diabetic complications. Present study was undertaken to study the association of hypertension and BMI, in type 2 diabetic patients

AIMS & OBJECTIVES

- To evaluate the association between BMI and type II diabetes mellitus
- To evaluate the association between hypertension and type II diabetes mellitus
- To evaluate the prevalence of hypertension in type 2 diabetes mellitus

MATERIALS & METHOD

The current study is a cross-sectional design to determine the relationship between body mass index, hypertension & type II The present study was undertaken in Smt. NHL Medical College and Hospital and Rajasthan Hospital. Patients were taken both from outpatient and inpatient department.

Two-hundred patients were undertaken who were diagnosed type 2 diabetes Mellitus and were assessed after taking informed consent. All were assessed with detailed history, clinical and relevant investigation by a special preformed prepared for study. Results were statistically evaluated.

All type 2 Diabetic patients diagnosed according to American diabetic Association with duration of 1 year or more were included in the study. Type I diabetics, recently detected, gestational diabetics subjects were excluded.

After written informed consent of the subjects fasting blood sugar & post prandial blood sugar done by GOD/POD enzymatic method & HBA1C by ion exchange resin method in the laboratory. Height, weight and BMI were recorded by standard method. Blood pressure was recorded by Blood pressure was measured and classified as per the Seventh Report of the Joint National Committee, Geneva, Switzerland.

Values are expressed as means ± SD. Microsoft® Office Excel® 2007 (© 2006 Microsoft Corporation, USA) and SPSS Statistics 20.0 (IBM® SPSS® system, IBM Corp. New York) were used for data analysis.Correlation was evaluated by Spearman's rho bivariant correlation. The probability level for significance was set at $p < 0.05$.

RESULTS

200 subjects (150 male and 50 female) were included in the present study and analysis was done. Following observation and result were made from the studied subjects.

Table 1: Age wise distribution of study population

AGE IN YEARS	MALE	FEMALE	TOTAL
41-50	42	10	52
51-60	50	16	66
61-70	48	20	68
71 and above	10	4	14
Total	150	50	200
Mean Age* (in year's ± SD)	57.933 ±9.1853	59.62 ± 8.635	58.355±9.0592

Totally two hundred patients were studied in this (150 males and 50 Females).maximum patients were present between the age group of (61-70) years. Followed by age groups (51-60), (41-50), and least number of patients were in the age group (71 and above). *No significant difference was observed between male and female groups (P>0.05)

Table 2: BMI pattern and mean BMI in diabetic patient

BMI Pattern Kg/m2	MALE	FEMALE	TOTAL	P VALUE
Underweight (<18)	14 (16.928±0.513)	-	14	-
Normal (18-24.9)	62 (21.92±1.80)	28 (21.54 ± 2.308)	90	p>0.05
Overweight (25-29.9)	42 (26.967±1.658)	10 (26.242±1.417)	52	p>0.05
Obese (30-39.9)	32 (33.793±2.713)	08 (34.56±3.458)	40	p=0.05 Insignificant
Morbid Obesity (>40)	-	04 (41.5±1.73)	04	-
Total	150	50	200	

Statistically there was no significant difference in normal and overweight groups among males and females. (P>0.05)

TOTAL BMI	MALE	FEMALE
25.59±5.947	25.400±5.59	26.16±6.93

Table 3: Glycemic control among males and females

CONTROL	MALE	FEMALE	TOTAL
NORMAL(<6.5)	08	02	10
GOOD(6.5-7.5)	16	08	24
POOR(>7.5)	126	40	166
TOTAL	150	50	200

17% cases had good glycemic control, 83% had poor glycemic control**.**

Mean Glycosylated hemoglobin

Total	MALE	FEMALE
8.9 ±1.35	8.93 ± 1.38	8.8 ±1.28

No significant difference was observed between male and female groups. (P > 0.05)

Table 4: mean fasting blood sugar levels, post prandial blood sugar levels glycolated haemoglobin

FBS (mg %)	PPBS (mg %)	HBA_1C
167.147±50.905	253.166±63.66	8.9±1.35

Table 5: Presence or Absence of Hypertension

BP (CATEGORY) mmHg	MALE	FEMALE	Total
Normal <120/80	62	16	78
Prehypertension(120-139/80-99)	10	10	20
Hypertension			
Stage 1 (140-159/90-99)	40	10	50
Stage 2(>160/100)	38	14	52
Total	**150**	**50**	**200**

Among the study group 51% were hypertensive, 10% were in the prehypertension stage, and 39% had normal blood pressure

Blood pressure, sex variation and its Statistical Significance

TOTAL SYSTOLIC BP	MALE	FEMALE
134 ± 25.023	133.22 ± 25.123	136.32 ± 24.827

TOTAL DIASTOLIC BP	MALE	FEMALE
85.62 ± 14.719	85.16 ± 15.279	87 ± 12.937

DISCUSSION

The current study was a cross-sectional study design and analyzed data for 200 type II diabetic patients set out to look at the possible relationship with BMI & hypertension.

In present study of 200 cases the mean total age was 58.355 RT± 9.059 as compare to Udavit H. Et all & Meenu Walia et al where total mean age was 50.60.65±5.64 & 53.12±8.86 respectively.[7, 8] The mean age in our study is slightly higher than other study. Mean BMI of our study is 25.59±5.947 while in Menu Walia et all it was 21.80±4.32 so BMI was significantly high compare to other study. Mean FBS, PPBS & HbA1C in our study are 167.147±50.905, 253.166±63.66 & 8.9±1.35 respectively, while in Lily john et al these values were 155.67±53.92, 243.36±71.05 & 7.43±2.88.[9] All three parameters were significantly higher compared to other study.

In our study Mean systolic blood pressure was 134±25.023 & mean diastolic pressure was 85.62±14.719 while in Meenu Wali et all mean systolic & mean diastolic pressure were 134.36±19.27 & 82.99±9.09. There was no much difference between systolic blood pressure but diastolic blood pressure in present study was higher compared to other study. Meanwhile among study group 51% are hypertensive 10% were in pre hypertension stage & 39 % had normal blood pressure.

Hypertension affects over 600 million people in the world. It is twice as common in diabetics as compared to non-diabetics.[5] Hypertension is an independent risk factor which influences morbidity and mortality from serious cardiovascular and cerebrovascular events.

CONCLUSION

This study shows that BMI & hypertension has positive association with diabetes mellitus. Hypertension & obesity are modifiable risk factor for several micro vascular complications of type II diabetes mellitus. Hypertension is twice as common in diabetes as in the general population, and affects 50% of type 2 diabetics. Modification of life style, diet & exercise plays important role in hypertension & type II diabetes mellitus.

Ethical Clearance: Ethical clearance taken from Ethical Review Board, NHL Municipal Medical College, Ahmedabad, Gujarat

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Conflict of Interest: Nil

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Association of Lipid Profile and Obesity as Cardiovascular Risk Factor in Smokers and Non-smokers

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ABSTRACT

Background: Obesity & smoking leads to elevated levels of lipid profile thus they increase the risk of developing cardiovascular disease. Aim of the study undertaken, is to evaluate the association of smoking and obesity with altered plasma lipid profile and also to establish smoking as a major risk factor in the development of cardiovascular disease in male smokers v/s non-smoker healthy matched controls.

Method: The subjects were divided into two groups healthy smokers (n=70) & healthy non-smokers (n=50).The smoker & non-smoker subjects were further classified into two sub-groups on the basis of BMI. Fasting blood samples were collected from both cases and controls and lipid profile was estimated by using auto-analyzer.

Results: Observation of the lipid profile of two sub-groups of smoker category (normal weight & overweight or obese) showed that TC (P<0.0001), TG (P<0.0005), LDL-C (P<0.0001) & AI (P<0.0001) were increased significantly in smoker-obese as compared to smokers with normal weight; while the serum levels of HDL-C (P<0.0001) were decreased significantly in them. TC (P=0.051) & TG (P=0.2151) of non-smoker obese subjects were increased statistically in a non-significant manner. Their LDL-C (p=0.0127) & AI (P=0.0299) were significantly increased; while the serum levels of HDL-C (P=0.0448) were decreased significantly in this sub-group. The plasma lipid profile of smokers was found to be increased in a statistically significant manner (P<0.0001) in comparison to non-smokers.

Conclusion: Obese & smoker people are at increased risk of developing CVD.

Keywords: *Cigarette smoking, Lipid profile, Cardiovascular risk, Atherogenic index.*

INTRODUCTION

One of the major risk factor in the initiation of coronary atherosclerosis and development of coronary heart disease is smoking. It alters the normal plasma lipoprotein pattern which may lead to increased risk of developing cardiovascular diseases (CVD); sudden death is 2-4 times more in heavy smokers than in non smokers[1].Indeveloping countries, CVD accounts for 31.7% of total deaths and mortality due to CVD is expected to rise to 19 million by 2020[2].

In the Indian subcontinent, CVD manifests itself almost 10 years earlier on an average compared with the rest of the world. In western countries, CVD accounts for only 23% of the CVD deaths occurring below the age of 70 compared to 52% of CVD deaths below the age of 70 in India[3]. The association between dyslipidemia, obesity, and hypertension is well established and all have been found to be major risk factors for the development of CVD, a leading cause of visits to physicians and cause of death[4].

Lipid profile includes total cholesterol, LDL-C (low density lipoprotein cholesterol) which is also called "bad" cholesterol and HDL-C(high-density lipoprotein cholesterol) which is also called "good" cholesterol because it serves a protective function; it sucks up

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cholesterol found in the bloodstream and returns it to the liver for disposal while LDL-C carries cholesterol from the liver to the cells. Therefore, high levels of HDL-C are desired so that any free cholesterol will be quickly removed from the blood. Proper physical exercise is one way to increase the concentration of HDL-C[5].

Smoking is an important cause of high cholesterol levels and heart disease so smoking affects cholesterol levels by dramatically raising the amount of LDL-C and decreasing the amount of HDL-C. It also increases the fatty lipid levels in the blood stream and accelerates the process of atherosclerosis[6].

Therefore, the present study was designed to investigate the association of obesity, plasma lipid profile and AI as markers for CVD among smokers & non-smokers.

MATERIAL AND METHOD

This study was conducted in the department of Physiology, SGRRIM &HS, Dehradun, from October 2015 to April 2016. The subjects chosen in this study were evaluated by a self-administrated questionnaire form in semi-structure individual interviews; the participants were matched for body mass index &age.

Total 120 subjects (age = 20-60 years) were divided into two groups healthy smokers (n=70) & healthy non-smokers (individuals who have never smoked) (n=50). Healthy non-smokers were recruited as control. The smoker& non-smoker subjects were further classified into two sub-groups. Subjects with BMI = 19.5 - 25 kg/m² were considered as of normal weight, while those with BMI ≥25 kg/m² were classified as overweight or obese. Only male adults were included in this study. The subjects were briefed about the study and their consent was taken.

Subjects with the history of diabetes mellitus, hypertension, coronary heart disease, endocrinopathy and those who were taking any lipid altering substance were excluded from the study.

All anthropometric measurements like height & weight of each subject were recorded and BMI was calculated. A fasting venous blood sample was drawn from each subject for lipid profile.

ANTHROPOMETRIC MEASUREMENTS

1. Weight- was measured in kilograms (kg) to the nearest 0.5 kg on a portable weighing scale with the subject in light clothing and without shoes.

2. Height- was measured in centimeters (cm) to the nearest 0.1 cm with the subject standing against the vertical wall with no shoes and heels together. Heels, buttocks, shoulders and head were touching the vertical wall surface while taking the measurement.

3. Body Mass Index (BMI) - was calculated by using the formula

Weight (kg) / Height (m^2)

Biochemical parameters

A morning venous blood sample after an overnight fast (10–12 hours) was drawn. The blood samples were placed on ice until separation within 2 hours. The samples were centrifuged at 2000 g for 5 min, after which plasma was isolated into dry plain plastic screw-capped containers and stored frozen at -20°C prior to analyses. Plasma total cholesterol and triglyceride concentrations were determined by enzymatic colorimetric assay, and HDL-C and LDL-C were determined enzymatically after precipitation of other lipoproteins as described by Burstein et al.[7],respectively, using kits from Centena Biomed Laboratories (Lucknow). All samples were analyzed in duplicates, after which the mean was determined.

Atherogenic index (AI) was calculated for individual subjects by the equation:

AI = [(total cholesterolHDL-C)/HDL-C].[8]

Cut-off values

W.H.O. reference values were adopted for classification of obesity[9]. For lipid profile the cut-off values from the National Cholesterol Education Program were adopted[10].Abnormalities in lipid levels have traditionally been defined as concentrations 95th percentile for total cholesterol, triglycerides, and LDL-C, whereas, low HDL-C concentrations have traditionally been defined as5th percentile.

The normal values of Lipid Profile used in our study are:

Total Cholesterol (TG) : < 200 mg/dl

Triglycerides (TC) : < 150 mg/dl

Low Density Lipoprotein (LDL-C) : < 130 mg/dl

High Density Lipoprotein (HDL-c) : > 40 mg/dl

STATISICAL ANALYSIS

The significance between the standard errors of means of different sets of observation was assessed by applying unpaired t-test and 95% level of confidence ($p< 0.05$).The statistical significance was set at the p value of $p<0.05$while, $p>0.05$ was considered as non-significant.

OBSERVATIONS AND RESULTS

Table (1): Comparison between two subgroups of non-smoker category.

Parameters	Normal Weight (BMI=19.5 - 25 kg/m²)	Over Weight or obese (BMI >25 kg/ m²)	P-value
Age in years	28.96 ± 10.23	33.04 ± 12.45	=0.2116
BMI (kg/m²)	21.42 ± 1.87	27.64 ± 1.92	<0.0001***
TC(mg/dl)	150.64 ± 34.54	166.56 ± 21.50	=0.051
TG(mg/dl)	141.4 ± 59.21	163.28± 63.85	= 0.2151
LDL-C(mg/dl)	77.32 ± 35.78	98.50± 19.80	= 0.0127**
HDL-C(mg/dl)	45.04 ± 6.68	41.4 ± 5.78	= 0.0448*
AI	2.48 ± 1.11	3.09 ± 0.79	= 0.0299*

Data are presented as the mean±standard deviation. *moderately significant (*P* value: ≤ 0.05), **strongly significant (*P* value : ≤ 0.01), ***extremely significant (*P* value : ≤ 0.0001).

Table 1 shows that the lipid profile parameters LDL-C, AI were significantly increased and TC, TG were increased non-significantly while HDL-C were significantly decreased in obese non-smokers as compared with normal weight non-smokers.

Table (2): Comparison between two subgroups of smoker category.

Parameters	Normal Weight (BMI=19.5 - 25 kg/m²)	Over Weight or obese (BMI >25 kg/ m²)	P-value
Age in years	31.18± 10.52	34.2 ± 12.81	=0.2849
BMI (kg/m²)	22.24 ± 1.92	28.59± 1.79	<0.0001***
TC(mg/dl)	177.11± 34.22	225.86± 20.05	<0.0001***
TG(mg/dl)	162.23± 52.14	211.43± 60.27	=0.0005**
LDL-C(mg/dl)	103.43 ± 36.47	145.17± 19.26	<0.0001***
HDL-C(mg/dl)	35.08 ± 7.83	26.17 ± 5.47	<0.0001***
AI	4.41 ±1.96	7.94 ± 1.99	<0.0001***

Data are presented as the mean ± standard deviation. *moderately significant (*P* value: ≤ 0.05), **strongly significant (*P* value : ≤ 0.01), ***extremely significant (*P* value : ≤ 0.0001).

Table 2 shows that the lipid profile parameters TC, TG, LDL-C, AI were significantly increased while HDL-C were significantly decreased in obese smokers as compared with normal weight smokers.

Table (3): Comparison between smokers & non-smokers.

Parameters	Smokers	Non-smokers	P-value
Age in years	37.57 ± 11.73	31 ± 11.47	=0.0028**
BMI (kg/m^2)	27.42 ± 3.69	24.53 ± 3.66	<0.0001***
TC(mg/dl)	201.48± 37.12	158.6 ± 29.57	<0.0001***
TG(mg/dl)	186.83 ± 61.18	152.34 ± 61.94	= 0.0030**
LDL-C(mg/dl)	124.30 ± 35.78	84.91± 29.63	<0.0001***
HDL-C(mg/dl)	30.63 ± 8.07	43.22 ± 6.54	<0.0001***
AI	6.17± 2.65	2.79 ± 1.003	<0.0001***

Data are presented as the mean ± standard deviation. *moderately significant (P value: < 0.05), **strongly significant (P value : < 0.01), ***extremely significant (P value : < 0.0001).

Table 3 shows that the lipid profile parameters TC, TG, LDL-C, AI were significantly increased while HDL-C were significantly decreased in smokers as compared with non-smokers.

DISCUSSION

The present study evaluated the association of lipid profile and body mass index as cardiovascular risk factors in smokers& non-smokers. The main findings of our study were that obese smokers had consistently more adverse cardiovascular risk factors, including increased body mass index, hypercholesterolemia, hypertriglyceridemia, and atherogenic index, with lower HDL-C levels than in those individuals who were non-obese and non-smokers.

The aforementioned risk factors were established by the Framingham heart study which was initiated in 1948 by the United States Public Health Service to study the relationship of number of risk factor (e.g. serum cholesterol, blood pressure, weight and smoking) to the subsequent development of cardiovascular disease[11].

Several studies have shown that the association between obesity and cardiovascular risk begins early in life[13]. It is therefore important to identify potential risk factors early when prophylactic care must be cost effective e.g. cigarette smoking[14].

AI is a highly sensitive marker of difference of lipoproteins in patients. AI values of 0.3-0.1 are associated with low, 0.1-0.24 with medium and above 0.24 with high cardiovascular risk[17].

Body Mass index (BMI) and Lipid Profile in non-smokers

When compared according to BMI; a non-statistically significant increase in TC (*P*=0.0512) and TG (*P*=0.2151), while statistically significant increase in LDL-C (*P*=0.0127) & AI (p=0.0299) was found in obese non-smokers as compared to non-obese non-smokers. A statistically significant decrease in HDL-C (*P*=0.0448) level was also seen in obese non-smokers; but both the groups were having values within normal range. This finding was similar to observation reported by Regina Fisberg et. al.[18]. Similar observations were made by Mataix et. al., and Nagila et. al. in their studies[19,20].

Body Mass index (BMI) and Lipid Profile in smokers

When compared according to BMI a statistically significant increase in TC (*P*<0.0001), TG (*P*=0.0005), LDL-C (*P*< 0.0001) & AI (p<0.0001) was found in obese smokers as compared to non-obese smokers. A statistically significant decrease in HDL-C (*P*<0.0001) level was also seen in obese smokers. Obesity and smoking are important causes of morbidity and mortality worldwide[21]. According to the Framingham study, obese individuals, who smoke have a 14 years reduction in life expectancy at the age of 40 years[22]. A large prospective study showed that smoking coupled with obesity contributes substantially to all-cause mortality, with a 3.5 – 5 fold greater risk for severely obese smokers than for normal weight non-smokers[23]. Some other research studies clear that, smoking and obesity are the main causes of preventable morbidity and mortality in developed countries[24]. Our study also supports the previous studies and hence BMI is very important to predict cardiovascular risk and relationship between smoking and obesity.

Lipid Profile in smokers V/s non-smokers

In our study, we observed statistically significant elevated levels of TC ($p<0.0001$), TGs ($p=0.0030$), LDL-C ($p<0.0001$), and AI ($p<0.0001$) in smokers when compared to non-smokers, whereas HDL-C was significantly ($p<0.001$) decreased in smokers as compared to non-smokers. Similar findings were found in other studies done by Alharbi[35], Venkatesan et. al.[26] and Krupski[27]. Smoking causes an immediate constriction of both proximal and distal coronary arteries as well as an increase in coronary vessel tone and hence resistance[28] that induces the release of catecholamines (epinephrine and norepinephrine) [29]. This leads to increased lipolysis and increased concentration of plasma free fatty acids (FFA), which further results in increased secretion of hepatic FFAs and hepatic TGs in the blood stream[30]. Consequently, lipid peroxidation is promoted, which is hypothesized to be one key element in the causal pathway of atherogenesis[31].

CONCLUSION

Thus, it is concluded that obese individuals depict the parameters indicating increased cardiovascular risk such as high TC, TG, LDL-C, AI, and low HDL-C as compared to non-obese and similar results were noted down in smokers as compared to non-smokers. Smoking habit of an individual alters the lipid metabolism and elevates the plasma lipid levels. When atherogenic index was compared, higher values were observed in smokers. The atherogenic index is a powerful indicator to predict the risk of CVDs because this index is a lipid ratio which can be used for identifying individual at higher risk of developing cardiovascular disease in the clinical practices; especially when the absolute values of lipid profile seem to be normal or higher but not markedly deranged.

Conflict of Interest: Nil

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Ethical Clearance: Taken from institute's ethical committee.

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A Comparative Study to Assess Quality of Sleep among Swimmers and Non Swimmers

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ABSTRACT

Background: Sleep is not only a restorative process which allows the mind and body to rest, but it is also a dynamic activity during which processes vital to health and wellbeing take place. Much of the literature features the effect of swimming on skeletal and cardiovascular health which is certainly an acknowledgement of the importance of swimming on health. But effect of swimming on quality of sleep is untested and there is often insufficient information related to it. Hence this study was taken up to evaluate the effect of swimming on sleep.

Methodology: A total of 60 swimmers (regular swimming for at least 30 minutes for 4 times/week from past 2 years) and 60 non swimmers in the age group of 20-40 years who were recruited after considering eligibility criteria were tested for pattern and quality of sleep using PSQI (Pittsburgh Sleep Quality Index) questionnaire

Results: Results were statistically analysed using student's 't' test. PSQI score was found to be statistically significant between swimmers and non-swimmers (P value is <0.05). Swimmers had better quality of sleep in terms of sleep latency, duration, and efficiency compared to non-swimmers

Conclusion: Swimming has a beneficial effect on sleep. Swimmers were found to have better pattern and quality of sleep than non-swimmers.

Keywords: *Sleep quality, Swimming, Pittsburgh Sleep Quality Index.*

INTRODUCTION

Good sleep is fundamental necsessity[1]. It is essential for the physical health, as well as for cognitive and affective functioning[2]. There is a growing evidence that burden of insomnia has become a major problem in the present era. Poor sleep, increasing sleep fragmentation with consistent wake up times during bedtime can seriously affect learning capacity and work performance[3].

Insufficient sleep arising from the biological, psychological, sociocultural, lifestyle and environmental factors may also have a significant negative impact on functioning capacity at home and in the academic settings[4]. With the change in the modern society and people's life style greatly attributing to longer working hours and more shift work, health issues are increasing sharply.

Abundant evidences from epidemiological and laboratory studies have revealed that insufficient or disturbed sleep is associated with glucose intolerance, insulin resistance, thus increasing the risk of developing diabetes mellitus[5]. It is also associated with heart diseases and decreased quality of life [6].

Swimming represents a non weight bearing sport[7] found to lower stress level and increase self- esteem. Swimming should not be just considered a sport but it should rather be a lifestyle. Considering the pivotal role of sleep for good health, to assess if swimming can help one acquire good quality of sleep becomes essential. Hence this study is undertaken to evaluate the effect of swimming on quality of sleep.

MATERIALS AND METHOD

Study population:

The work includes a study of 60 swimmers (regular swimming for at least 30 minutes for ≥ 4 times/week from past 2 years) and 60 non swimmers of Bangalore

matched for age and sex who were selected after obtaining clearance from the Institutional Ethical Committee. Study period was from March 2016 to June 2016. Informed written consent was taken from each subject after explaining the study protocol.60 swimmers in the age group 21 to 40 years were selected for the study after considering the eligibility criteria

METHODOLOGY

A detailed history taking and relevant clinical examination was done for all subjects prior to the study. Individuals with diabetes mellitus, hypertension, psychiatric illness, neurological disorders, endocrinal disorders, alcohol intake, smoking, or any substance abuse were not taken for the study. Subjects receiving any CNS medications (Antipsychotics, antidepressants, sedative-hypnotics) were excluded. Subject with history of sleep disorders, and subjects who were on night shift works were also excluded from the study. Pattern and quality of sleep was assessed using PSQI (Pittsburgh Sleep Quality Index) questionnaire.

Pittsburgh Sleep Quality Index

Pittsburgh Sleep Quality Index (PSQI) [8] is a standardized self-rated questionnaire developed to assist in measuring sleep quality. The 21 item questionnaire generates seven component scores, with subscale scores 0 to 3: Sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. The addition of these seven components yields a global score of subjective sleep quality. The global score is 0 to 21; a score measuring <5 indicating good sleep quality, score of 6 to 8 indicating average sleep quality and a higher score of >8 is indicative of poorer subjective sleep quality. The sensitivity of the tool is 89.6% and specificity is 86.5% in distinguishing good and poor sleepers. PSQI has good reliability with high internal consistency ($\alpha = 0.83$) and a good test-retest reliability ($r= 0.85$)

Statistical Analysis: Statistical analysis was performed using SPSS software (version 19.0, IBM) Data presented as mean ± standard deviation. Independent Student's t-test (two tailed) was used to compare the two groups. P-value < 0.05 was considered statistically significant.

Results:

Total of 120 subjects participated in the study. Those subjects were divided into two groups, swimmers (n=60) and non-swimmers (n=60)

Table 1 shows demographic details of both the groups. Both the groups were age, BMI and gender matched.

Table 1: Demographic Details

	Swimmers (n=60)	**Non swimmers (n=60)**	**P-Value**
Age (yrs)	**25.83 ± 3.5**	**26.45 ± 2.26**	0.25
BMI (Kg/m^2)	23.08 ± 3.05	**24.2 ± 2.32**	0.40
Males	32	30	
Females	28	30	

T test (Group statistics)

	Group	**N**	**Mean**	**Std deviation**	**Std error mean**
PSQI score	Swimmers	60	3.33	1.323	.171
	Non swimmers	60	5.33	1.694	.219

Independent sample test

		t	**df**	**Significance (two tailed)**	**Std error difference**	**Lower 95% confidence interval of difference**	**Upper 95% confidence interval of difference**
PSQI	Equal variances assumed	-7.206	118	.000	.278	-2.550	-1.450
	Equal variances not assumed	-7.206	111.46	.000	.278	-2.550	-1.450

Table 2 Shows mean ± SD values of PSQI scores of both the groups with a low PSQI score which is statistically significant in swimmers indicating better quality and pattern of sleep compared to non-swimmers having a high PSQI score

Table 2: Scores of different tests of both the groups

	Cases Swimmers (n=60)	**Controls Non-swimmers(n=60)**
PSQI score	3.3 ± 1.32*	5.3 ± 1.69

P<0.05*

DISCUSSION

The present study reveals that swimmers were found to have better pattern and quality of sleep compared to non-swimmers. Increased levels of stress due to various factors results in sleep deprivation which cause sleep fragmentation, later bed times and consistent wake up time which affect the learning capacity and work performance[3] as well as triggering negative moods such as anger, confusion, tension and depression[9].

Sleep deficit leads to increased daytime sleepiness and affects daytime functioning. Daytime sleepiness is also used as an indicator of health status in both clinical and healthy population[10]. The prefrontal cortex which governs abstract thinking, creativity and the tasks involved with higher order neurocognitive functioning is known to be sensitive to sleep deprivation[3]. All these stimulate cerebral cortex, cerebral limbic system and hypothalamus which include the secretion of catecholamine from sympathetic ganglion and adrenal medulla and cortisol from pituitary adrenal system[11].

These hormones function to increase plasma glucose levels. Physiological experiments have proven that blood cortisol concentration and insulin resistance are increased as a consequence of sleep deprivation and thus affecting carbohydrate metabolism and endocrine function[12]. The work of Tang Yunzhao and colleagues in 2004 described that inadequate sleep in both quality and quantity should be regarded as a plausible risk factor for glycaemic control in type II diabetes mellitus[13]. Reduced levels of leptin, a hormone that regulates hunger and metabolism have been associated with shortened sleep and lead to greater energy and fat intake[14].

Derman et al in 2008 done a study and observed that swimming has been shown to have a positive effect on bone metabolism which was evident on duel energy X ray absorptiometry of total body calcium content and specific biochemical markers indicating that highly active non-impact sport like swimming lead to increased bone mineral content[15].Akgul et al in 2015 also reported similar findings by extending their investigations comparing swimmers and non-swimmers but significance was not reported[16]

Water offers a unique exercise medium in which reduced gravity conditions decrease the impact forces on joints, while the water itself creates resistance to movement. Swimming strengthens the muscle, help manage weight by burning calories. It improve sleep, lowers stress levels and increase self-esteem by decreasing comorbidities and increasing quality of life.

There were few limitations in the present study. Larger population should have been studied to generalize the findings. Sleep parameters are assessed by self-rated questionnaires. Future studies could consider objective assessment using polysomnography for a better result compared to subjective assessment using questionnaire.

CONCLUSION

Swimming has beneficial effect on sleep. Swimmers were found to have better pattern and quality of sleep than non-swimmers.

Clinical implication: Aquatics (swimming) may be an alternative training mode to improve overall fitness especially in persons with low levels of physical fitness. Aquatic rehabilitation has also been shown to improve muscle performance and endurance in elderly people, in patients suffering from Rheumatic arthritis, fibromyalgia, knee disorders and poliomyelitis related disabilities

Conflict of Interest: The authors declare that there is no conflict of interests regarding the publication of this paper

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A Review on Alteration of Bilirubin Level & Association of Hepatomegaly in Patients with Falciparum Malaria

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ABSTRACT

Objective - To find out the alteration of bilirubin level & association of hepatomegaly in patients with falciparum malaria.

Design – Retrospective study.

Settings – Department of Physiology along with department of medicine & department of Biochemistry, SCB Medical college & hospital, Cuttack.

Method – 100 patients suffering from Falciparum malaria [confirmed by MP slide or ICT] who were admitted to medicine department were selected after considering the exclusion criteria . They are subjected to detail clinical hematological & biochemical examination.

Conclusions – plasmodium falciparum malaria predominates in males [M:F ratio = 7.33 : 1]. Hepatomegaly was found in 51.1 % of patients suffering from falciparum malaria and having icteus. Majority of patients [56%] suffers from conjugated hyperbilirubinemia.

Keywords – *Hepatomegaly in falciparum malaria, bilirubin in falciparum malaria.*

INTRODUCTION

Malaria is the most important of the parasite disease of humans. Still today it has a heavy burden on tropical communities.out of all malarial infection falciparum malaria is most life threatening once vital organ dysfunction occurs the mortality rate rises steeply. The present study is aimed to understand the alteration of bilirubin level & association of hepatomegaly in patients with falciparum malaria. This study shows that falciparum malaria predominates in males [M:F ratio = 7.33:1]. Hepatomegaly was found in more than half [51.1%] of the cases where plasmodium falciparum malaria was associated with icterus. Majority of patients [56%] suffers from predominant conjugated hyperbilirubinemia.

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OBJECTIVE

1. To find out the alteration of bilirubin level in patients of falciparum malaria.

2. To find out the association of hepatomegaly in patients of falciparum malaria.

MATERIALS & METHOD

This study was conducted in the PG Department of physiology along with department of medicine & biochemistry in SCB Medical college Cuttack from September 2006 to September 2008. Cases admitted to medicine indoor with complaints of fever with or without jaundice and with or without altered sensorium were screened for plasmodium falciparum. 100 Confirmed cases of MP slide +ve or MP ICT +ve cases were subjected to detail clinical & biochemical

examination for this study. Routine hemogram along with serum bilirubin level [both total & direct] were carried out. Cases with following criteria were excluded from the study.

1. Cases of chronic alcoholism
2. Cirrhosis of liver
3. Septicemia associated with other causes
4. Viral hepatitis
5. Congenital hyperbilirubinemia
6. Cases of hepatotoxic drug therapy.

OBSERVATION

1. Gender distribution – out of 100 cases 88 were males & 12 were females. Ratio being M:F = 7.33 :1.

2. Age distribution – out of 100 cases 48% were in the age group 15 – 29 years, 30% cases were in age group 30-44 years & 22% cases were above 44 years.

Table -1: AGE WISE DISTRIBUTION

AGE IN YEARS	MALE	FEMALE	TOTAL
15-29	**40**	**8**	**48**
30-44	**28**	**2**	**30**
Ũ45	**20**	**2**	**22**

Table-1 shows the age distribution

3. Symptomatology – Table 2 indicates the different symptomatology of falciparum malaria. All the patients presented with fever. Icterus was observed in 47% cases. Out of them 32 had hepatomegaly & 25 had splenomegaly. Anemia was found in 82% cases. 60% cases had altered sensorium where as vomiting was found in 10% cases.

Table -2: SYMPTOMATOLOGY

Signs & Symptoms	Number of cases (%)
Fever	100 (100%)
Icterus	47 (47%)
Alter Sensorium	60 (60%)
Hepatomegaly	32 (32%)
Splenomegaly	25 (25%)
Anaemia	82 (82%)
Vomiting	10 (10%)

4. Total serum bilirubin level in falciparum malaria :- Table 3 & graph – 1, shows the total serum bilirubin level in falciparum malaria. 49% cases had serum bilirubin level < 3 mg%, 28% had serum bilirubun in the range of 3 – 10 mg%, 23% had serum bilirubin > 10 mg%.

Table -3: TOTAL SERUM BILIRUBIN LEVEL IN FALCIPARUM MALARIA

Total Serum bilirubin (mg%)	(%) Percentage
< 3 mg%	49
3-10 mg%	28
>10 mg%	23

5. Types of serum bilirubin in falciparum malaria – Out of 100 patients predominant conjugated serum bilirubin was found in 56% cases & both conjugated & unconjugated were found in 34% cases . predomoinantly unconjugated bilirubin was seen in 10 % cases.

Table -4: TYPES OF SERUM BILIRUBIN IN FALCIPARUM MALARIA

Type of bilirubin	Percentage
Predominantly conjugated bilirubin	56%
Mixed, both conjugated & unconjugated	34%
Predominantly unconjugated	10%

Table-4 indicates the conjugation pattern.

6. Association of jaundice with hepatomegaly in falciparum malaria – Out of 47 icterus +ve patients, 24 cases were having both icterus & hepatomegaly where as 23 cases had no signs of hepatomegaly. 8 patients had hepatomegaly where icterus was not found. 45 patients had neither hepatomegaly nor icterus. The association between icterus & hepatomegaly was found to be significant.

Table – 5: ASSOCIATION OF JAUNDICE WITH HEPATOMEGALY IN FALCIPARUM MALARIA PATIENTS

			HEPATOMEGALY		TOTAL
			Absent	Present	
ICTERUS	Absent	Count	45	8	53
		%	84.9%	15.1%	100%
	Present	Count	23	24	47
		%	48.9%	51.1%	100%
Total		Count	68	32	100
		%	68%	32%	100%

Table-5 shows association of jaundice with hepatomegaly in falciparum malaria patients.

7. Distribution of jaundice [age group] – 26 [53.3%]cases had icterus in the age group 15 – 29 years. 10 cases [34.5%] presented with icterus in the age group 35 – 44 years, where as in 45-60 years age group 11 [45.8%] were found.

Table – 6: DISTRIBUTION OF JAUNDICE (AGE GROUPS)

			ICTERUS		TOTAL
			Absent	Present	
A	15-29 yrs	Count	21	26	47
		%	44.7%	55.3%	100%
	30-44 yrs	Count	19	10	29
		%	65.5%	34.5%	100%
	45-60 yrs	Count	13	11	24
		%	54.2%	45.8%	100%
Total		Count	53	47	100
		%	53%	47%	100%

Table-6 depicts distribution of jaundice in average groups

8. Association of serum bilirubin level [Total bilirubin] with case fatality – Table 7 indicates association of serum bilirubin [Total] level with case fatality. There was no significant correlation between hyperbilirubinemia & case fatality.

Table – 7: ASSOCIATION OF SERUM BILIRUBIN (TOTAL) LEVEL WITH CASE FATALITY

			CASE FATALITY		TOTAL
			Absent	Present	
Serum bilirubin (Total)	3 mg%	Count	46	5	51
		%	90.2%	9.8%	100%
	< 3 mg%	Count	43	6	49
		%	87.8%	12.2%	100%
TOTAL		Count	89	11	100
		%	89%	11%	100%

DISCUSSION

In the present study 88% of study population were male & 12% were females with a male to female ratio 7.33 :1. This is consistent with the findings of the study of other authors like Mehta SR et al[5] , mazumdar et al [4], Nityanand et al[3], P.K.Dash et al[10] , Shrivastav et al[13] . All above authors have studied the liver abnormalities in falciparum malaria & reported the higher incidence of falciparum malaria in males because of the fact that males are having more outdoor activities and ill clothed than their female counter parts.

48% of cases were in the age group of 15 – 29 years, 30% were of 30-44 years & 22% were more than 44 years of age. This values are in slight variation with the study by P.K.Dash et al[10] & Mehta et al[5] . It could be explained on the basis of small number of cases in our study group.

Icterus was found in 47% cases in our study group. Reports with low incidence jaundice were reported by WHO (2.5%)[7], Mehta SR et al (2.38%)[5], Mazumdar et al (70%)[4], Anand et al (2.5%)[6]& Mishra SK et al (20%)[2]. These reports were not consistent with our findings on the basis of incidence of jaundice . High incidence of jaundice reported by Nityanand et al (57%) [3], P.K.Dash et al (64%)[10] & Murthy et al (66%)[8]could be due to endemicity of malaria in the region from where the reports have originated.

Most important observation made in the present study was the presence of fever with icterus in cases having no cerebral symptoms at the time of admission & such cases were likely to be misdiagnosed as cases of viral hepatitis unless a meticulous search for the presence of malaria parasite in peripheral blood is made to establish the diagnosis.

Hepatomgaly was seen in 51.1% of cases having icterus in this study. P.K.Dash et al[10] reported hepatomegaly in 100% of their cases. Kocher et al[14] reported hepatomegaly in 48% of their cases, where as Mazumdar et al[4] reported in 64% of cases. High percentage of hepatomegaly found in our study could be attributable to endemicity of malaria in this zone.

Serum bilirubin was raised in 53% of patients. The range varied from 0.4 mg% to 35 mg%. Wide range of bilirubin variation was also found in previous studies WHO (7-10 mg%)[7], P.K.Dash et al(6-38 mg%)[10], Nityanand et al (2.5 – 64.5 mg%)[3], Chawla et al (2-40 mg%)[12], Mazumdar et al (3.1 – 24.1 mg%)[4], Trang et al (10 – 45 mg%0[11]. Although jaundice is considered to be frequent sign in malaria it has wide range of variation. Possible reason for this variation are level of endemicity (endemic vs epidemic), age, plasmodium species (vivax vs falciparum), case definition (inclusion of complicated cases only where the incidence of malaria is higher). In the present study bilirubin level was <3 mg % in 50% cases, between 3 – 10 mg% in 27% cases & > 10 mg% in 23 % cases. Similar values were observed by Kocher et al[14].

In our study 56% cases had predominantly conjugated bilirubin, 10% cases had predominantly unconjugated bilirubin & mixed pattern in 36% cases. This values are consistent with P.K.Dash et al[10], who reported predominant conjugated pattern in 60% cases. Our findings also matches with the earlier reports of Chawla et al[12], Harris et al[9] & Mazumdar et al[4], but it is not consistent with reports of Mishra SK et al[2], Wilairatana et al[1]. Both of them found predominant unconjugated bilirubin in 67% cases in their studies.

The association between jaundice & hepatomegaly was found to be significant in our study. It is supported by P.K.Dash et al[10] & Anand et al[6], where hepatomegaly was found in 100% case of jaundice.

CONCLUSION

From this study it can be concluded that Plasmodium falciparum malaria predominates in males (M:F = 7.33: 1). Hepatomegaly which is correlative of jaundice was observed in many (51.1%) icterus cases. Majority of patients (56%) suffers from predominant conjugated hyperbilirubinemia.

Therefore a patient with icterus, fever & raised serum bilirubin levels should not be viewed only as a case of hepatitis of viral origin, but the possibility of Plasmodium falciparum infection should be kept in mind & he should be investigated and treated accordingly to prevent fatal complications.

ABBREVIATIONS :-

1. MP – Malaria parasite.
2. ICT – Immunochromatography test.

Conflict of Interest :- Nil

Source of Funding :- Self

Ethical Clearance :- Taken from ethical clearance committee SCB Medical College, Cuttack, Odisha.

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Alteration in Cardiac Autonomic Activity after Music Therapy in Young Women

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ABSTRACT

Introduction: Music is a low cost intervention which has shown to be an efficient method of modulating emotions and autonomic nervous system activity [1]. Relaxation effect of music is due to shift of autonomic balance towards parasympathetic predominance in healthy adults [6]. Heart rate variability (HRV) is a reliable, non invasive method used to evaluate autonomic nervous system. Effect of music on different cardiovascular parameters in different phases of menstrual cycle remains unknown. Therefore, we evaluated the effects of music on cardiovascular response in different phases of menstrual cycle in young women.

Materials & Method: Females aged between 18-25 years having regular menstrual cycles were included in the study. Basal HRV recording was done during Menstrual phase (MP) (day 1–5); follicular phase (FP) (day 6–14) and luteal phase(LP) (day 15–28)[13] of the same menstrual cycle. To avoid potential diurnal variations, subjects were tested (HRV) at the same time of day**.** ECG recording was done again in MP,FP,LP of the next menstrual cycle. On the day of ECG recording, subject was asked to listen to music for 30mins, Music intervention was given to all the 30 subjects. Raaga Malakauns and Yaman by flute recording were used for music intervention**.**

Results: HR, SBP, RPP and frequency domain parameters showed significant difference after music in menstrual &follicular phase when compared to Luteal phase**.**

Conclusion: Relaxing effect of music is more during follicular phase of menstrual cycle

Keywords: *Music, HRV, menstrual cycle*

INTRODUCTION

Music is a low cost intervention which has shown to be an efficient method of modulating emotions and autonomic nervous system activity [1]. Listening to music involves emotional, neurological, cardiovascular changes, with behavioural modifications of breathing [2,3]. Music has shown to reduce maternal anxiety and increase breast milk production [4]. Music alters ECG signals, blood pressure, heart rate, respiratory rate, middle cerebral artery blood flow [5]. Relaxation effect of music is due to shift of autonomic balance towards parasympathetic predominance in healthy adult [6].

Autonomic nervous system exerts its fast-acting, short-lived effects together with slow-acting, long-lived effects of the endocrine system, on heart rate & blood pressure to regulate blood perfusion[7]. Study suggests that altered functioning of the autonomic nervous system in the late luteal phase could be associated with diverse psychosomatic and behavioral symptoms appearing premenstrually as premenstrual syndrome[8]. Heart rate variability (HRV) is a reliable, non invasive method used to evaluate autonomic nervous system. Many studies have reported that eumenorrhea subjects

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had significantly greater HRV and increased vagal activity in follicular phase and increased sympathetic activity during luteal phase [9,10,11]. HRV analysis reflect overall cardiac health and hearts ability to adapt to changing circumstances by detecting and responding to unpredictable stimuli (chatterjee. Et al (12). However effect of music on different cardiovascular parameters in different phases of menstrual cycle remains unknown. Therefore, we evaluated the effects of music on cardiovascular response in different phases of menstrual cycle in young women.

MATERIALS AND METHOD

A longitudinal observational study was conducted among 30 female volunteers aged between 18 & 25years in the department of physiology in M S Ramaiah Medical College in Bangalore after obtaining Institutional Ethics Committee clearance before the commencement of the study. The subjects were explained the testing procedure and protocol. Informed consent was obtained to participate in this study. A detailed medical and menstrual history was obtained from all participants. Demographic data, Standard anthropometric measurements like height, weight, body mass index (BMI), basal cardiovascular parameters like HR, SBP, DBP were collected.

Females between the age group of 18-25years having regular menstrual cycles (21-35days) were included in the study. Females with irregular menstrual cycles, or having dysmenorrhea or taking treatment for dysmenorrhea like Oral Contraceptive Pills were excluded. Females who are diagnosed to have secondary dysmenorrhea and any other gynecological problems or any co morbid conditions were excluded. Subjects were asked to abstain from caffeine containing beverages on the day of recording.

Basal ECG recording was done during Menstrual phase (MP) (day 1–5); follicular phase(FP) (day 6–14) and luteal phase(LP) (day 15–28) (reference 13) of the same menstrual cycle. To avoid potential diurnal variations, subjects were tested (HRV) at the same time of day between 8:00 and 9:00 AM (reference 14) in a quiet room 12 Hr postprandial (reference 15). All subjects were asked to be in the supine position with a normal breathing rate and depth with their eyes closed and in a relaxed state at least 15 min before data collection.

ECG recording was done again in Menstrual phase (MP) (day 1–5); follicular phase(FP) (day 6–14) and luteal phase(LP) (day 15–28) of the next menstrual cycle. On the day of ECG recording, subject was asked to listen to music for 30mins, at the end of 30mins ECG was recorded. Music intervention was given to all the 30 subjects. Raaga Malakauns and Yaman by flute recording were used for music intervention. Subject was asked to comfortably sit & listen to music using earphones in a quiet room for 30mins in the morning on the day of recording.

ECG of the subject was recorded using PHYSIOPAC-PP4 software (MEDICAID SYSTEMS, Chandigarh). The data was analyzed using RMS Vagus HRV software (RMS, India). The time domain parameters of HRV such as mean heart rate (HR); SDNN-Standard deviation of Normal to Normal RR interval; RMMSD-Standard deviation of square of mean root; PNN50-Percentage of Consecutive RR interval whose difference is more than 50 millisecond were measured. HRV analysis was extracted using Kubios HRV analysis software.

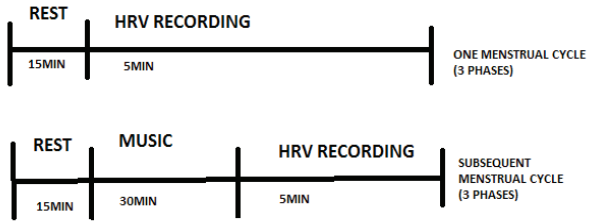

Figure 1: Study design. Participants rested for 15mins and then HRV was recorded in 3 phases of menstrual cycle. In the subsequent menstrual cycle in all 3 phases 15 min rest was given. Music intervention for 30mins, immediately followed HRV was recorded

HR, SBP, DBP, ECG were recorded in the menstrual phase on 2nd day before & after listening to music for 30mins.

STATISTICAL ANALYSIS: The data were expressed as mean ± SD. One way ANOVA was applied to compare the HRV data among the 3 phases of menstrual cycle in cases and controls. To test significance paired and unpaired t test was applied. P-value <0.05 was considered statistically significant. If the value of q is greater than 4.087 then the P value is less than 0.05.

RESULTS

In the present study we assessed cardiovascular

responses in 30 young women aged 18-25years before and after listening to music in three phases of menstrual cycle over a period of 6 months duration. Mean age of the participants was 19.47±1.63 years with BMI of 21.92±2.15.

Table 1: Basal cardiovascular parameters of the subjects in Music (M) and Non-Music(NM) group

		MP	FP	LP
HR (bpm)	NM	78±9.90	75±1.41	75.5±10.61
	M	72±2.83*	68.5±10.61*	70±8.28
('q'value)		4.358	4.721	3.938
SBP (mmHg)	NM	120±18.38	118±18.38	103±18.38
	M	105±18.38*	100±14.41**	102±19.80
('q'value)		4.565	5.478	0.3043
DBP(mmHg)	NM	73±12.73	76±11.31	74±11.31
	M	70±11.31	64±8.49**	73±12.73
('q'value)		1.441	5.765	2.882
MAP(mmHg)	NM	88.67±14.61	90±13.67	83.67±13.67
	M	81.67±13.67	76±10.37***	82.67±15.08
('q'value)		2.820	5.640	0.4029
RPP	NM	93.6±3.75	88.5±15.25	77.77±23.52
	M	75.6±2.74***	68.5±13.01***	71.4±10.18
('q'value)		7.348	8.164	2.600

Data is expressed as mean±SD. HR-heart rate; SBP: Systolic Blood Pressure; DBP: diastolic Blood Pressure; MAP: Mean Arterial Pressure; RPP: Rate Pressure Product. Statistical analysis was done by one-way ANOVA followed by post-hoc Tukey-Kramer Multiple Comparisons Test among 3 phases. P-value <0.05 was considered significant. *<0.05 , **<0.01, ***<0.001

In Table 1 shows Mean heart rate (HR), Systolic blood pressure (SBP) & rate pressure product (RPP) showed significant decrease after listening to music in menstrual & follicular phase. Diastolic Blood Pressure(DBP) & Mean Arterial Pressure (MAP) showed significant difference after listening to music in follicular phase. Music caused significant changes in cardiovascular parameters mainly in follicular phase but did not show significant changes in Luteal phase.

Table 2: HRV parameters of the subjects in Menstrual phase in Music (M) and Non-Music(NM) group

	Non-Music(NM) group	Music (M)	p- value
LF(n.u)	62.9±8.49	55.9±18.38	0.063
HF(n.u)	36.9±8.45	50.95±28.35	0.01**
LF/HF	1.70±1.01	1.09±0.64	0.01*
TP (ms^2)	595±196.58	655.50±130.81	0.16
SDNN(ms)	44.17±8.56	39.74±15.83	0.1687
RMMSD	38.9±10.32	37.21±18.10	0.66
PNN50(%)	33.32±10.52	20.7±21.21	0.005**
Mean RR(s)	0.87±0.02	0.83±0.07	0.0039**

Data is expressed as Mean±SD. HF-High Frequency; LF: Low Frequency; TP: Total Power; SDNN: Standard Deviation of Normal to Normal RR interval; RMMSD-Standard deviation of square of mean root; PNN50-Percentage of Consecutive RR interval whose difference is more than 50 millisecond; Statistical analysis was done by paired t test. P-value <0.05 was considered significant. *<0.05 , **<0.01, ***<0.001

Table 3: HRV parameters of the subjects in Follicular phase in Music (M) and Non-Music(NM) group			
	Non-Music(NM) group	**Music (M)**	**p- value**
LF(n.u)	62±10.52	64.05±5.86	0.35
HF(n.u)	40±5.84	45±10.23	0.02
LF/HF	1.55±1.80	1.42±0.57	0.7075
TP (ms^2)	628±154.8	714.6±132.40	0.0234
SDNN(ms)	65.34±21.13	72.48±16.4	0.07
RMMSD	54.64±16.53	58.23±11.06	0.1635
PNN50(%)	40.11±16.67	49.54±16.23	0.015
Mean RR(s)	72.77±11.04	78.45±8.06	0.0133
Data is expressed as Mean±SD. HF-High Frequency; LF: Low Frequency; TP: Total Power; SDNN: Standard Deviation of Normal to Normal RR interval; RMMSD-Standard deviation of square of mean root; PNN50-Percentage of Consecutive RR interval whose difference is more than 50 millisecond; Statistical analysis was done by paired t test. P-value <0.05 was considered significant. *<0.05 , **<0.01, ***<0.001			

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Table 4: HRV parameters of the subjects in Luteal phase in Music (M) and Non-Music(NM) group			
	Non-Music(NM) group	**Music (M)**	**p- value**
LF(n.u)	65±7.8	64±6.92	0.3007
HF(n.u)	52±7.4	56±7.05	0.01
LF/HF	1.25±1.05	1.14±0.98	0.6764
TP (ms^2)	712±98.5	756±86.03	0.0352
SDNN(ms)	38.32±6.8	40.35±12.83	0.22
RMMSD	56.23±12.05	54.99±18.18	0.3783
PNN50(%)	42±14.05	40.66±16.5	0.3680
Mean RR(s)	80±7.40	78.23±6.28	0.1610
Data is expressed as Mean±SD. HF-High Frequency; LF: Low Frequency; TP: Total Power; SDNN: Standard Deviation of Normal to Normal RR interval; RMMSD-Standard deviation of square of mean root; PNN50-Percentage of Consecutive RR interval whose difference is more than 50 millisecond; Statistical analysis was done by paired t test. P-value <0.05 was considered significant. *<0.05 , **<0.01, ***<0.001			

DISCUSSION

The present study investigated the effect of music on cardiovascular parameters during different phases of menstrual cycle in young healthy women. Our major findings were that music reduced systolic blood pressure and rate pressure product in menstrual and follicular phases of menstrual cycle in normal healthy women but showed no significant changes in Luteal phase. However, HF value which is a marker of parasympathetic activity showed a significant increase in all three phases of menstrual cycle. These results support our hypothesis that music elicits parasympathetic nervous system activity, thereby altering cardiovascular parameters.

As shown in Table 1 Listening to Music for a short duration as little as 30mins showed significant changes in blood pressure and heart rate. But these changes were more pronounced in menstrual and follicular phase. According to literature, Music is used as a relaxation technique as listening to meditative music reduces heart rate, blood pressure, & plasma catecholamines[16]. Study done by L Bernardi et al showed slow meditative music decreased heart rate but had no significant effect on blood pressure & respiration. They also applied pauses of 2minutes in music tracks, & observed greater relaxation that is fall in SBP, DBP, HR, & minute ventilation, LF: HF ratio during this short intermission due to release from selective attention on music[17]. The above findings

are consistent with our study as we also recorded HRV after stopping music at the end of 30mins.

Table 2 shows in menstrual phase HR, SBP, RPP , frequency domain parameters like HF, LF/HF ratio & time domain parameters like PNN50, mean RR showed significant changes after listening to music. Table 3 shows that in follicular phase HR, SBP, DBP, RPP, MAP, frequency domain parameters like HF, total power & time domain parameters like PNN50, mean RR showed significant changes after listening to music. Table 4 shows in luteal phase frequency domain parameters like HF, total power showed significant changes after listening to music. In Luteal phase sympathetic activity is relatively high, may be due to which the significant changes in BP, HR & other frequency domain parameters were not observed. Autonomic nervous system alteration secondary to listening to music as shown by HRV analysis is important clinically. In a study done on Post myocardial infarction patients, autonomic alterations are noted such as increased sympathetic outflow, reduced vagal outflow to heart[18]. Reduced HRV values predicted higher total mortality during 31 months follow up when 24hour ECG recording was obtained at approximately 2 weeks post MI[19]. Since listening to music causes increased parasympathetic activity, it can be used to bring about a particular change; and that change may be in therapeutic, emotional or spiritual aspect.

Music is employed as a relaxation technique post stress. Molecular changes after listening to music was shown by Barry Bittman et al. They compared 2 stress reduction techniques routinely used such as Recreational Music Making (RMM) & quiet reading following stress induction. He showed that RMM was more effective at altering the expression of molecular pathways than quiet reading. In participants randomized to RMM, 12 pathways showed significant dysregulation, compared to only two pathways in participants randomized to quiet reading. Relaxation through active engagement in Recreational Music Making may be more effective at altering gene expression and thus more clinically useful for stress amelioration[20].

Limitations: Estimation of endogenous hormones like FSH, LH, leptin, estrogen & progesterone, thyroid hormones was not done. Leptin will give a better understanding of influence of menstrual cycle on autonomic nervous system was not done in our study. Future studies should be undertaken to address these limitations using a larger sample size. Music was administered only for 30mins on the day of recording. In future studies long term use of music and its effects can be studied.

CONCLUSION

Music induces cardiovascular response, due to alteration in parasympathetic nervous system activity. These changes were more pronounced in the follicular phase of menstrual cycle compared to luteal phase**.**

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Conflict of Interest: Nil

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Effect of Cigarette Smoking on Serum Lipid Profile

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ABSTRACT

Introduction : Cigarette smoking is one of the major risk factors in the causation of coronary heart disease which can alter the normal lipoprotein pattern in the plasma.

Objectives: To analyse the effect of cigarette smoking on serum lipid profile in smokers and compare it with non-smokers.

Method: Present study included 60 healthy male smokers aged between 25-45years and was compared with 60 age and weight matched male non-smokers. Standard procedures were used to estimate the serum lipid levels. The obtained data was analysed statistically.

Results: Total Cholesterol in the smoker group was more than in non-smoker group. There was a significant high serum level of Low density lipoprotein cholesterol, triglycerides, very low density lipoprotein cholesterol in smokers. While the high density lipoprotein cholesterol was significantly low in smokers compared to non smokers.

Conclusion: Cigarette smoking can cause adverse effect on serum lipid profile, thereby increasing the risk of cardiovascular disease.

Keywords: *Cigarette smoking, Nicotine, Serum lipid levels*

INTRODUCTION

Cigarette smoking is a major risk factor for atherogenesis and in the development of coronary artery disease and peripheral vascular disease.[1] Smoking is now considered as one of the biggest threats to current and future health. [2]

Tobacco smoke, and specifically nicotine, has a significant effect on metabolism of lipids and its regulation in the blood. [3] Tobacco continues to be the second major cause of death in the world. [4]

Active or passive smoking, an either way can cause cardiovascular disease via a series of interdependent processes, such as alterations in the autonomic nervous system, increased oxidative stress, endothelial dysfunction, thrombosis, inflammation and hyperlipidaemia. [5]

Alterations in the plasma lipoproteins are said to be the underlying cause for the occurrence of atherosclerotic vascular diseases. [6] Studies related to cigarette smoking and its effects on lipids are many, mainly being international and a few Indian. [2] The present work is thus an attempt to determine the alterations in the serum lipid profile in smokers and compare with non-smokers.

OBJECTIVE

To analyse the effect of cigarette smoking on serum lipid profile in smokers and compare with non-smokers.

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MATERIAL AND METHOD

This descriptive study included 60 healthy male cigarette smokers with age group of 25-45years who smoked 10 -20 cigarettes/day for at least 5 years or more duration and 60 healthy age, diet and Body mass index (BMI) matched non smokers. Study was conducted at Government Medical College, Kozhikode after obtaining approval from institutional ethics committee and informed consent. The subjects were hospital staff and general public, aged between 25-45 years. Subjects with history of Hypertension, Diabetes, renal disease, hepatic impairment, endocrine disorders, obesity, alcoholic, subjects taking any medicines known to alter lipid profile were excluded from the study.

Blood samples were obtained after overnight fasting and was analysed for lipid profile on the same day of collection of each sample to avoid changes in the values of various fractions especially triglycerides. Enzymatic method was used to estimate total cholesterol (TC) and triglycerides (TG) and High Density Lipoproteins was determined by precipitation of phosphotungstic acid and LDL and VLDL were calculated by using Friedewalds formula.

The data were tabulated and all the values obtained were expressed as mean ± S.D (standard deviation). Student's t-test was used to compare the differences of lipid profiles between non-smokers and smokers with 95% confidence level and 5% level of significance.

RESULTS

Table 1 depicts the mean value of serum lipid levels in the study and control group. The mean values of Triglycerides, VLDL, Total Cholesterol and LDL were significantly increased in smokers (p value < 0.001) while the High density lipoprotein cholesterol was significantly reduced in smokers as compared to non smokers.

Table 1: Comparison of serum lipid profile in study population

Lipid-profile Parameters	Smokers (Mean± SD)	Non-smokers (Mean± SD)	p value
Total cholesterol	221.7 ± 32.29 mg/dl	171.8 ± 29.86mg/dl	< 0.001*
Triglyceride	135.44 ± 44 mg/dl	100.4 ± 53.38mg/dl	< 0.001*
HDL cholesterol	34.9 ±5.6 mg/dl	41.4 ± 8.7 mg/dl	< 0.001*
LDL cholesterol	152.2 ± 38.8 mg/dl	117.9 ± 30.6 mg/dl	< 0.001*
VLDL cholesterol	26.4 ± 8.3 mg/dl	19.9 ± 10.7mg/dl	< 0.001*

SD: standard deviation, *: highly significant.

DISCUSSION

The present study included 60 healthy smokers and 60 healthy non smokers between the age group of 25-45 years. All the subjects were analysed for lipid profile and other routine investigations. The present work was an attempt to compare the serum lipid profile of smokers with non smokers. Study revealed the mean values of VLDL, LDL, Total cholesterol, Triglycerides were significantly increased and HDL cholesterol was decreased in smokers compared to non smokers. Previous studies have reported the same findings that smokers have a higher risk lipid profile than non-smokers. [7,8,9] These findings indicate that cigarette smoking is associated with altered serum lipid levels.

Certain mechanisms have been proposed to analyse the link between smoking and changes in serum lipid profile. Indirectly, in the lung, gas-phase cigarette smoke can activate macrophages and neutrophils which then release oxidants and enzymes which damage lipids and proteins. [10,11] Nicotine has a significant effect on lipid metabolism. It stimulates the release of adrenaline which induces lipolysis leading to increase in free fatty acid (FFA) concentration. Increased release of FFA in turn stimulate the secretion of VLDL in liver and hence triglycerides and cholesterol. Increased concentration of FFA also raises myocardial workload and oxygen

consumption in the heart.[12,5]

All such alterations in the serum lipid profile induced by smoking in addition with damage to vascular endothelium are associated with a high incidence of atherosclerosis in smokers.[13]

Limitation, being the study was confined to males of specific age group and the sample size was less. Duration of smoking is not correlated with the effects on lipid profile parameters.

CONCLUSION

To conclude, cigarette smoking is associated with alteration in lipid profile and increases the risk of cardiovascular diseases. Hence, no matter how long people have been smoking regardless of their age, it is never too late to reap the benefits of quitting. Therefore educational intervention to the public about adverse health events of smoking should be undertaken.

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Conflicts of Interest: None declared

Ethical approval: Study was approved by Institutional Ethics Committee

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Acute Effect of Alcohol on Blood Pressure in Alcoholics

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ABSTRACT

BACKGROUND: Alcoholism means compulsive and uncontrolled consumption of alcoholic beverages usually to the detriment of drinker's health, personal relationship and social standing. Alcohol disrupts the normal homeostasis of our body and causes many neurological problems, hepatic problems, renal failure and cardiovascular diseases like heart failure, stroke, hypertension, coronary heart disease and peripheral vascular disease[1]. One of the major cardiovascular disease caused by alcohol on a long term use is hypertension but some studies say that alcohol has beneficial effects on the cardiovascular system[2]. **OBJECTIVES:** The present study aims to study the acute effect of alcohol consumption on blood pressure in chronic alcoholics and to find out any associated neurological problems like memory loss, mood changes and sleep disturbances. **METHOD:** This cross-sectional study was conducted on 50 male chronic alcoholics who are not known hypertensives. Blood pressure was recorded using a mercuric sphygmomanometer before, after 5minutes and after 1 hour of alcohol consumption (2 units of alcohol [1 unit =44.5ml]). **RESULTS:** There was a significant rise in systolic blood pressure immediately after alcohol consumption ($p<0.001$) and the mean rise in systolic blood pressure was 4.72 mm Hg and after one hour it fell down by 2.96 mmHg from the initial rise. The mean rise in diastolic blood pressure was 2.64 mmHg immediately ($p<0.0001$) and after one hour it reached the baseline level. So it may concluded that the predominant acute effect of alcohol on blood pressure is a rise in systolic and diastolic blood pressure.

Keywords: *Alcoholism, Blood pressure.*

INTRODUCTION

Alcoholism means compulsive and uncontrolled consumption of alcoholic beverages usually to the detriment of drinker's health, personal relationship and social standing. This is called alcohol dependence syndrome and the people suffering from this are called alcoholics. Alcohol disrupts the normal homeostasis of our body and incurs many problems to the human life. It causes many neurological problems, hepatic problems, renal failure and cardiovascular diseases like heart failure, stroke, hypertension, coronary heart disease and peripheral vascular disease[1]. One of the major cardiovascular disease caused by alcohol on a long term use is hypertension. Alcohol causes hypertension but some studies say this has beneficial effects on the cardiovascular system. Hypertension induced by alcohol may be the precursor for numerous problems related to various vital systems of our body. Even in small amounts chronic alcohol consumption may lead to hypertension, cardiac dysfunction and congestive cardiomyopathy[2]. Alcohol in large or small amounts leads to hypertension on long run[3,4]. Chronic low to moderate alcohol consumption has cardio protective effect[5]. But the acute effect of alcohol on blood pressure on chronic alcoholics was not clearly documented in any of the above studies.

OBJECTIVES

The present study aims to study the acute effect of alcohol on blood pressure and ill effects caused by chronic alcohol consumption such as memory loss, sleep disturbance, anxiety and depression.

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MATERIALS AND METHOD

STUDY DESIGN:

This is a cross sectional study.

STUDY PERIOD: May 2012 to August 2012.

STUDY PLACE : For this study, the data collection was done in Coimbatore and Tirupur districts which are industrial cities and people from all walks of life and people from all religion live side by side .This provides the necessary scope for the present study and so the above districts have been selected. The study was conducted in wine shops of Coimbatore and Tiruppur districts.

STUDY SUBJECTS

The study group included 50 male subjects who are chronic alcoholics.

INCLUSION CRITERIA: Chronic alcoholic males who consumes nearly 3-4 units of alcohol daily for at least 3 years.

EXCLUSION CRITERIA: Non-alcoholic males and alcoholic male who are known hypertensives. Females and children are also excluded from the study.

METHODOLOGY

Before proceeding the study an Ethical Committee clearance was obtained from Coimbatore Medical College. Initially a questionnaire relating to alcoholic history, diet, drug intake and other problems like memory loss, sleep disturbance were completed by the respondents. A written consent was obtained from the respondents. Then the subject was asked to sit in a chair and the blood pressure was recorded from the left arm using a mercuric sphygmomanometer. Blood pressure was measured by palpatory method and then by auscultatory method. The subject was given two units (90 ml) of alcohol (spirit). After five minutes of rest the blood pressure was recorded from the left arm and again the blood pressure was recorded from the left arm after one hour.

STATISTICAL ANALYSIS

Statistical analysis was done using SAS software. Mean and standard deviation was calculated. Statistical analysis was done by using Z test and Chi square test to test the significance of the mean. Results were expressed as mean ±SD or adjusted mean ±SEM or number of subjects and percentage.

OBSERVATIONS AND RESULTS:

•There was a significant rise in systolic blood pressure immediately after alcohol consumption and the mean rise in systolic pressure was 4.72 mmHg and after 1 hour it fell down by 2.96 mmHg from the initial rise.

•In diastolic blood pressure also there was a significant rise and the mean rise was about 2.64 mm Hg immediately after alcohol consumption and after 1 hour it reached the baseline level.

•There was no statistically significant relationship between alcohol consumption sleep disturbances, memory loss etc.

TABLE I : AGE DISTRIBUTION

AGE	FREQUENCY	PERCENT	VALID PERCENT	CUMULATIVE
Valid less than 30 years	1	2.0	2.0	2.0
30-40 years	17	34.0	34.0	36.0
40-50 years	15	30.0	30.0	66.0
50-60 years	13	26.0	26.0	92.0
Above 60 years	4	8.0	8.0	100.0
Total	**50**	**100.0**	**100.0**	

TABLE II: YEARS OF ALCOHOL CONSUMPTION

YEARS OF ALCOHOL CONSUMPTION	FREQUENCY	PERCENT	VALID PERCENT	CUMULATIVE PERCENT
Valid between 5-10 years	7	14.0	14.0	14.0
Between 10-15 years	5	10.0	10.0	24.0
Between 15-20 years	13	26.0	26.0	50.0
Between 20-25 years	4	8.0	8.0	58.0
Above 25 years	21	42.0	42.0	100.0
Total	**50**	**100.0**	**100.0**	

TABLE III: PRE CONSUMPTION SYSTOLIC BLOOD PRESSURE VS SYSTOLIC BLOOD PRESSURE IMMEDIATELY AFTER ALCOHOL CONSUMPTION

ALCOHOL CONSUMPTION	NUMBER OF PARTICIPANTS	MEAN SBP mmHg	STANDARD DEVIATION	STANDARD ERROR	t value	P value
Pre consumption	50	131.16	12.4152	1.7557	12.632	0.001
Immediately after alcohol consumption	50	135.88	11.8659	1.6781		

0.001*

The mean difference, in systolic BP before and immediately after consumption of alcohol is statistically significant ($p<0.001$)*. It can be inferred that there is a significant increase in systolic blood pressure immediately after alcohol consumption.

7.333*

TABLE IV: PRE CONSUMPTION SYSTOLIC BLOOD PRESSURE VS SYSTOIC BLOOD PRESSURE 1 HOUR AFTER ALCOHOL CONSUMPTION

ALCOHOL CONSUMPTION	NUMBER OF PARTICIPANTS	MEAN SBP mmHg	STANDARD DEVIATION	STANDARD ERROR	t value	P value
Pre consumption	50	131.16	12.4152	1.7557	7.333	0.001*
1 hour post consumption	50	132.92	12.6504	1.7890		

The mean difference, in systolic Blood Pressure before and one hour after consumption of alcohol is statistically significant ($p<0.001$)*. It can be inferred that there is a significant increase in systolic blood pressure one hour after alcohol consumption.

TABLE V: PRE CONSUMPTION DIASTOLIC BLOOD PRESSURE VS DIASTOLIC BLOOD PRESSURE IMMEDIATELY AFTER ALCOHOL CONSUMPTION

ALCOHOL CONSUMPTION	NUMBER OF PARTICIPANTS	MEAN DBP mmHg	STANDARD DEVIATION	STANDARD ERROR	T value	P value
Pre consumption	50	85.64	7.5451	1.0670	7.653	0.0001*
Immediately after alcohol cosumption	50	88.28	7.4396	1.0521		

The mean difference, in diastolic blood pressure before and immediately after consumption of alcohol is stastically significant ($p<0.0001$)*. It can be inferred that there is a significant increase in diastolic blood pressure immediately after alcohol consumption.

TABLE VI: PRE CONSUMPTION DIASTOLIC BLOOD PRESSURE VS DIASTOLIC BLOOD PRESSURE ONE HOUR AFTER ALCOHOL CONSUMPTION

ALCOHOL CONSUMPTION	NUMBER OF PARTICIPANTS	MEAN DBP mmHg	STANDARD DEVIATION	STANDARD ERROR	t value	P value
Pre consumption	50	85.64	7.5451	1.0670	0.455	0.651
1 hour after alcohol consumption	50	85.44	7.1376	1.0094		

The mean difference, in diastolic blood pressure before and one hour after consumption of alcohol is not statistically significant ($p<0.651$). It can be inferred that there is no significant difference between diastolic blood pressure before and one hour after alcohol consumption.

DISCUSSION

In this study it was found that there was a rise in both the systolic and diastolic blood pressures immediately after alcohol consumption and the systolic blood pressure was towards the baseline after 1 hour and the diastolic blood pressure reached the baseline after 1 hour.

Our study is in agreement with the PRIME study conducted in France[6] and other studies[7,8,9]. These studies state that blood pressure immediately rises after alcohol consumption and it falls down during the hangover period. The acute increase in blood pressure may due to increased secretion of corticotrophin releasing hormone which stimulates ACTH secretion and sympathetic activity and abstinence from alcohol consumption decreases the blood pressure.

S. Ceron et al [9] states that chronic ethanol consumption leads to hypertension. This process is a multimediated event involving increased sympathetic activity, stimulation of the renin- angiotensin-aldosterone system with a subsequent increase in vascular oxidative stress and endothelial dysfunction. Ethanol mediated generation of superoxide anion and hydrogen peroxide in vascular tissues is associated with elevations in intracellular calcium, reduced nitric oxide bioavailability, endothelial dysfunction and vasoconstriction. Thus through increased generation of reactive oxygen species and activation of redox- sensitive pathways, ethanol induces vascular dysfunction, that might contribute to the hypertension associated with ethanol consumption.

The results of our study are contradictory with other studies[10,11,12,13] which state that the acute effect of alcohol consumption on blood pressure is reduction of blood pressure and they say that the predominant acute effect of alcohol ingestion in patients with hypertension is blood pressure reduction, and it may be associated with a decrease in intracellular sodium and decrease in adrenoreceptor mediated cardiovascular reactivity.

In another study[14] it was found that alcohol may have an acute biphasic effect on Systolic BP , with an initial decrease as the alcohol is ingested followed by an increase toward the basal level during detoxication. No significant effects were found for diastolic BP.

In this study we found that there is no statistical association between alcohol consumption and sleep disturbance and memory loss. But. Kirk J Brower states that older alcoholics have increased sleep disturbances when compared to younger alcoholics and non alcoholics of both age groups[15]. Both acute and chronic alcohol consumption alter the activity of neurotransmitters like serotonin, norepinephrine, GABA, glutamate and noradrenaline as well as other sleep factors. These alterations may contribute to the sleep disturbances observed in alcoholics and in people undergoing alcohol withdrawal[16].

Further in our study it was found that there is an association between amount of alcohol consumption and depression.

CONCLUSION

In this study the systolic and diastolic blood pressure before and after alcohol consumption were measured using a mercuric Sphygmomanometer and compared.

There is a significant rise in the systolic and diastolic blood pressure after alcohol consumption and the BP falls down during the hangover period. So it may be concluded that the predominant acute effect of alcohol consumption in the study group is a rise in Blood Pressure.

LIMITATIONS

This study has been carried out only in 50 chronic alcoholics. A large sample size study and a follow-up study annually on BP changes after alcohol consumption may have given more insights into the results. Although several studies are available regarding the alcoholism and blood pressure the specific risk estimates for different beverages were limited. In this study the data collection was made during a convenient time for the subjects. It is also possible that potential biological effects of alcohol vary with time of exposure.

SCOPE FOR FUTURE WORK

Further study could be extended to evaluate the blood pressure changes with consumption of different types of alcoholic beverages. The association between the amount of alcohol consumption and depression should be studied in detail.

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Conflict of Interest: Nil

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Effect of Oxytocin on Blood Pressure Variation During Cesarean Section

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ABSTRACT

Objectives: Present study was carried out to determine the variation of Blood Pressure (BP) during different stages of Cesarean section (CS) and the effect of oxytocin on BP to help in establishing better perinatal care towards achieving the goal of healthy mother and baby.

Material and method: Hundred cases of CS done under spinal anaesthesia in Nalanda Medical College Hospital, Patna were evaluated. Blood Pressure was recorded at the time of admission, after premedication, after skin incision, after delivery of head of baby, after Oxytocin injection, after delivery of baby, after delivery of placenta, after repair of uterus and after skin repair.

Results: Baseline mean Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were 117± 7.13 and 77.88 ± 5.66 mmHg. There was significant rise in SBP and DBP after premedication (129.29±5.15 & 86.56± 4.12 mmHg respectively, $p < 0.05$). SBP and DBP falls significantly after Oxytocin injection (112.76±6.50 & 72.42±4.05mmHg), after delivery of baby (112.76±6.50 &71.08±3.46 mmHg) and after delivery of placenta (110.96±5.47 & 71.56±3.19 mmHg).

Conclusion: There is wide variation in BP during Cesarean section and it falls significantly after Oxytocin injection. Close monitoring of BP during CS may result in better perinatal outcome.

Keywords: *Cesarean Section, Diastolic Blood Pressure, Oxytocin, Systolic Blood Pressure, Variation.*

INTRODUCTION

Blood Pressure (BP) fluctuates during different stages of normal labour. Data on variation of BP during Cesarean Section (CS) are scarce. Obviously several factors appear to be involved in causing the variations in blood pressure during CS. But data on factors associated with variation in BP are scant and less well studied. So further observation of BP variations in CS is very necessary.

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Oxytocin is a 9-amino-acid peptide that is secreted in vivo by the posterior pituitary gland. It was first discovered in 1909 by Sir Henry Dale , later synthesized in 1954 by du Vigneaud , and since then has been used for labour induction, augmentation and management of the third stage of labour. Oxytocin is given to women during CS to decrease blood loss. Oxytocin is the most commonly used uterotonic agent in obstetrics. It is routinely administered after both normal and operative delivery to initiate and maintain adequate uterine contractility for minimizing blood loss and preventing postpartum hemorrhage.[1] Several regimens of Oxytocin have been tested during cesarean delivery (CD) with variable wanted (uterotonic) and unwanted (cardiovascular) effects.[2,3,4,5,6,7,8]

Larger dose of oxytocin injected rapidly is known to produce various adverse effects such as hypotension,

nausea, vomiting, chest pain, headache, flushing, myocardial ischemia, ST-T segment changes, pulmonary edema, severe water intoxication, and convulsion.[9] The magnitude of these effects is dose-related.[10] However, these effects are not widely appreciated by clinicians as highlighted in the Confidential Enquiry into Maternal Deaths (CEMD) published in 2001.[11] Weis and colleagues[10] showed that patients receiving an infusion were more haemodynamically stable. So, the present study was done with an aim to determine the variation of BP during different stages of CS and effect of oxytocin on BP during CS.

MATERIALS AND METHOD

Hundred pregnant females with normal ante-partum course and absence of any systemic disease undergoing CS at term in Department of obstetric & Gynaecology at Nalanda Medical College and Hospital, Patna were evaluated. The subjects were both primigravidae and multigravidae. All these subjects were admitted for the management of labour in the labour rooms of the Hospital for Woman, Nalanda Medical College Hospital, Patna. Each subject was required to have the following:-

Inclusion Criteria

Absence of history of systemic disease

Normal antepartum course

Cesarean section at term ,without any complication, with a live foetus.

Blood pressure in normal range.

Exclusion criteria

Subjects with hypertension, diabetes mellitus, toxemia of pregnancy or taking medication which interfere with blood pressure were excluded.

All the cases were started with premedication of 1 ampoule of atropine i.e. 0.6 mg 45 minute before the operation and 10 mg of metoclopramide i.e. 1 ampoule intravenous and 100 mg of ranitidine i.e. two ampoules slow i.v. were given half an hour before the operation, at the same time infusion of Ringer's lactate was started in such a manner that about 15 -20 ml per kg body was infused before the spinal block . Blood Pressure was recorded at the time of admission, after premedication , after skin incision, after delivery of head of baby, after Oxytocin injection (10 IU IM), after delivery of baby, after delivery of placenta, after repair of uterus and after skin repair. All data were expressed as mean±standard deviation (S.D.). Statistical analyses was done using graph pad instat software. Statistical significance was accepted at $P<0.05$.

RESULTS

Table 1: Subject characteristics

Age(yrs)	24.04±5.279
Gravida	1.4±0.4984
Gestational weeks	39.10±0.6604
Hemodynamic variables BaselineSBP(mmHg) BaselineDBP (mmHg)	 117± 7.13 77.88± 5.66
Neonatal Weight(Kg)	2.54±0.423

All values are expressed as Mean ± SD

Table 2: Systolic Blood Pressure recordings of the Study Subjects (n=100)

SBP(mm Hg)	Range	Mean	S.D	S.E of mean	P value	Inference
On admission	100 -130	117.78	7.13	1.008		
In O.T+ RL 1Litre	118 -140	129.28	5.15	0.729	<0.001	HS
After skin incision	100 -130	119.04	5.48	0.776	>0.05	NS
After delivery of head	100 -128	118.10	5.37	0.759	>0.05	NS
After oxytocin	96-122	112.76	6.50	0.919	<0.001	HS
After delivery of child	100-120	110.96	5.47	0.774	<0.001	HS
After delivery of placenta	90-120	111.00	6.31	0.893	<0.001	HS
After repair of uterus	100-130	113.72	5.83	0.824	<0.001	HS
After repair of skin	104-136	117.86	5.60	0.792	>0.05	NS

NB: HS - Significant at 0.1% or 1%.
S - Significant at 5% level.
NS - Not Significant.

Table 3 : Diastolic Blood Pressure recordings of the Study Subjects (n=100)

DBP(mmHg)	Range	Mean	S.D	S.E of mean	P value	Inference
On admission	68 -90	77.88	5.65	0.799		
In O.T+ RL 1Litre	76 -94	86.56	4.12	0.583	<0.001	HS
After skin incision	68 -84	76.96	4.32	0.611	>0.05	NS
After delivery of head	68 -84	76.48	3.97	0.562	>0.05	NS
After oxytocin	64 -80	72.42	4.05	0.573	<0.001	HS
After delivery of child	60 -78	71.08	3.46	0.489	<0.001	HS
After delivery of placenta	64 -80	71.56	3.19	0.451	<0.001	HS
After repair of uterus	66 -80	73.64	3.17	0.449	<0.001	HS
After repair of skin	62 -86	77.08	4.54	0.642	>0.05	NS

NB: HS - Significant at 0.1% or 1%.

S - Significant at 5% level.

NS - Not Significant.

Baseline mean Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were 117± 7.13 and 77.88 ± 5.66 mmHg. There was significant rise in SBP and DBP after premedication (129.29±5.15 & 86.56± 4.12 mmHg). SBP and DBP fall significantly after oxytocin injection (112.76±6.50 & 72.42±4.05), after delivery of baby (112.76±6.50 &71.08±3.46) and after delivery of placenta (110.96±5.47 & 71.56±3.19 mmHg) respectively.

DISCUSSION

Observation on BP variation during CS have been made on 100 cases which come at random from different socioeconomic groups. Most of the cases showed increase in systolic blood pressure and diastolic blood pressure values after premedication with atropine during Cesarean section. Fall in the systolic blood pressure and diastolic blood pressure during spinal Caesarean delivery had been seen after Oxytocin injection , after delivery of baby and after delivery of placenta.

Pregnant women undergoing Cesarean delivery are at increased risk of obstetric hemorrhage, mainly due to uterine atony. Oxytocin is the mainstay of treatment for uterine atony.[1] Prophylactic routine use of Oxytocin has been shown to reduce the incidence of post-partum hemorrhage by up to 40%[12]. Despite widespread use, there is limited data to guide the optimal Oxytocin dosing in patients undergoing elective Cesarean Delivery. When 5 IU bolus IV was compared with 5 IU infusion, mean arterial pressure (MAP) decreased up to 27 mm of Hg and heart rate (HR) increased by 7 beats/minute at 35 seconds in the bolus group, which recovered to baseline at 110 seconds. The infusion group in contrast had a decrease in mean arterial pressure (MAP) of only 8 mm Hg and heart rate (HR) increased by 10 beats/minute.[7] The reduction in mean arterial pressure and speed of recovery are dose dependent. [13] The haemodynamic effects of oxytocin receive scant attention in pharmacology texts, but may be clinically significant in vulnerable patients. In a randomised, double-blind study of the haemodynamic changes induced by rapid bolus of 5 or 10 units of oxytocin in 34 healthy term parturients at CS under spinal anaesthesia, there was a small but statistically significant (P 0.05) reduction in mean arterial pressure from baseline 30 sec. after a 10-unit bolus. However, large, statistically significant increases in heart rate and cardiac output occurred at one min. after 5 units and at 2 min. after 10 units. These changes peaked 1 min after oxytocin administration and were greater in the 10-unit group (P 0.05). The importance of these findings is that some women with hypovolemia or cardiac disease may be unable to mount these compensatory responses and are therefore at risk of haemodynamic collapse after Oxytocin boluses. [13]

In one study, 30 women undergoing elective CS were randomised to receive 5 u of Oxytocin either as a bolus injection (bolus group) or an infusion over 5 min (infusion group). Heart rate and intra-arterial blood pressure were recorded every 5 sec throughout the procedure. There were marked cardiovascular changes in the bolus group compared with infusion group (heart

rate increased by 17± 10.7 vs 10 ±9.7 beats per min). The mean arterial pressure decreased by 27 ± 7.6 mmHg in the bolus group compared with 8 ±8.7 mm Hg in the infusion group[7] The Oxytocin induced desensitization is dependent upon the duration of Oxytocin exposure and occurs over a clinically relevant time frame of approximately 4.2 hours. [14] A case of allergic reaction to synthetic Oxytocin administered during Cesarean section was reported.[15]

CONCLUSION

There are wide variation in Blood Pressure during Cesarean Section. Significant fall in Blood Pressure occurs after Oxytocin injection. So, close monitoring of Blood Pressure during Cesarean Section especially in vulnerable subjects (cardiovascular disease etc.) is needed for achieving better perinatal outcome.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Taken

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To Study the Reactivity to Cold Pressor Test in Young Healthy Medical Students Before and After Yoga

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ABSTRACT

Background: - Yoga is an ancient philosophical and religious tradition thought to have originated in India around 5000 BC. Yoga is practiced in India and all over the world for over thousands of years. Increased awareness of health and natural remedies, yogic techniques including asanas and pranayamas are gaining importance and receiving world wide acceptance.

Aims & Objectives:

1. To find out the incidence of hyper-reactors to Cold Pressor Test in young healthy medical students.

2. To study the reactivity to Cold Pressor Test in young healthy medical students before and after Yoga.

Material & Method: In the present study, 53 young healthy medical students underwent cold pressor test. 20 turned out to be hyper reactors to this test. These hyper reactors performed Yoga (Suryanamaskar) for 3 months and Cold Pressor Test was again performed at the end of this period. And cardiovascular hyper-reactivity (parameters are Blood pressure, Pulse rate, and Respiratory rate) compared before and after yoga.

Results: In our study incidence of Hyper reactor to cold Pressor Test was 37%. In the present study Hyper-reactivity to cold pressor test decreased after 3 months of Yoga.

Conclusion: The present study has been undertaken with the aim of de-stressing the hyper-reactors by the application of Yoga. This may be a humble attempt towards restoring the peace and normalcy of life.

Keywords: *Cold Pressor Test, Hyper reactors, Stress, Yoga, Suryanamaskar.*

INTRODUCTION

Suryanamaskar (literally translate as "sun salutations") regular practice produces statistically significant reduction in pulse rate, which is attributed to increased vagal tone and decreased sympathetic activity , decreased sympathetic activity in turn reduces catecholamine secretion and also leads to vasodilatation leading to improvement in peripheral circulation. It is also observed that regular yogic practices reduce basal metabolic rate and resting oxygen consumption. All these may be responsible for reduction in resting pulse rate. These factors also decrease work load on heart leading to decrease in cardiac output and hence systolic blood pressure[1, 2].

Yogic practices alter the hypothalamic discharges leading to decrease in sympathetic tone and peripheral resistance and hence the diastolic blood pressure. Regular yogic practices strengthen the respiratory muscles; increase the excursions of diaphragm and lungs as well as thoracic compliance. Yoga practices also decrease airway resistance. All these factors contribute to improvement in the various lung function tests after regular practice of suryanamaskar[3, 4, & 5].

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Yogic practices also improve respiratory muscle endurance[6].

Through practicing various body postures (asana), breathing techniques (pranayama), and meditation, it is believed that one can obtain a sound physical body as well as a calm and peaceful mind[7].

Regular practice of a variety of yoga techniques have been shown to lower heart rate and blood pressure in various populations[8,9,10]. In recent years, it has become more apparent that people need techniques to help them cope with the everyday stressors of modern life, with stress related hypertension and cardiovascular diseases.

Today's highly technological and competitive life style is poising a great stress on the society, resulting in the imbalance of physical & psychological changing leading to psycho-somatic disorders.

Stress is a common condition, a response to a physical threat or psychological distress that generates a host of chemical and hormonal reactions in the body[11].

Stress is described as a state of anxiety, strain, nervousness, tension, constant worry or pressure. It is an accepted fact that psychosocial factors operate through mental processes, consciously or unconsciously, to produce hypertension and other cardiovascular disorders[12].

Cardiovascular disease has become a major cause of mortality in developing nations in the age group of 30- 69 years. The cardiovascular mortality due to hypertension is seen more in developing nations [13, 14].

Scientific research has shown that non pharmacological methods like yogic asanas, pranayama, and meditation should be encouraged to control the modifiable risk factors by increasing parasympathetic activity and decreasing sympathetic activity and provides significant improvements in cardiovascular parameters and respiratory functions and physical fitness which improve one's tolerance to stressors[15, 16].

In a tension-filled society, yoga, pranayama and meditation alone will bring solace from all problems and hence they are the essence of life[17].

In 1932 Hines & Brown devised a method to test the reactivity of the body to cold stress. They observed the effect of pain caused cold stress in the form of rise in blood pressure and on this basis subjects could be classified as hypo-reactors or hyper-reactors. The hyper-reactors to cold stress are likely to develop cardiac disorders later on in any phase of life. These hyper-reactive subjects should be properly dealt with to lower the incidence of such disorders[18].

The present study has been undertaken with the aim of de-stressing the hyper-reactors by the application of Suryanamaskar, because hyper-reactors are likely to develop hypertension in future life. This may be a humble attempt towards restoring the peace and normalcy of life.

MATERIAL & METHOD

Study group comprised 53 healthy subjects of 18-24 years. They were subjected to cold pressor test introduced by Hines & Brown**.** The study protocol was explained to the subjects and written consent was obtained. Approval by ethical committee of S.S. Medical College, Rewa, M.P. was also obtained. All the volunteers were clinically examined to rule out any systemic diseases.

Inclusion Criteria – Healthy, nonsmoker, with no cardio respiratory disorders and subjects not doing any type of physical exercises.

Exclusion Criteria – Subjects who were taking other physical activity like gym, athletics etc. And subjects who were smokers, alcoholic, with respiratory disorders, jaundice, diabetes or any other disease related with cardio respiratory system.

All the 20 hyper-reactive volunteers were first trained under the guidance of a certified yoga teacher for 15 days. Then they carried out 12 steps suryanamaskar for 30 minutes (15 rounds) ones a day for three months.

The volunteers practiced these exercises in the morning, in a quiet, well ventilated room or in open air space sitting in a comfortable posture.

After giving a rest for 10 minutes BP was measured in supine posture by sphygmomanometer. Two reading were taken 5 minutes apart and the mean of two was taken as the basal blood pressure.

All volunteers were subjected for cold pressor test, of Hines & Brown 1932. A thick walled thermocol box measuring 38 cm × 26 cm × 18 cm, closed from all

sides, was used. A hole was made in the centre of the top of the box to allow entry to one hand of the subject. Another small hole was made at the corner of the top of the box for laboratory thermometer. Before starting the experiment the thermocol box was filled with cold water and the laboratory thermometer was placed in such a way that its mercury bulb was immersed in the cold water. Temperature inside the box was maintained in the range of 3-4^{0}C. The hand was immersed in cold water up to the wrist for one minute (cold stress).

Response showing by elevated blood pressure was categorized as—

1. Hyper-reactors: - Those subjects in whom the systolic blood pressure raised more than 20 mm Hg and/or diastolic blood pressure raised more than 15 mm Hg.

2. Hypo-reactors: - Those subjects in whom the systolic blood pressure didn't exceed 20 mm Hg and /or diastolic blood pressure more than 15 mm Hg.

RESULTS

The present study entitled "To study the reactivity to cold pressor test in young healthy medical students before and after yoga" showed that yoga causes significant reduction in the cardiovascular hyper-reactivity. 53 asymptomatic medical students in 18-24 yrs age group were subjected to cold pressor test. Out of the 53 subjects 20 were hyper-reactor to cold pressor test. These hyper-reactors practiced yoga regularly for three months and after this period the 14 volunteers became hypo-reactors, whereas no change in the hyper-reactivity was observed in six volunteers.

Statistical analysis: The statistical analysis was carried out using paired't' test by using SPSS-16 software.

TABLE NO. 1: DISTRIBUTION OF SUBJECTS ACCORDING TO SEX AND AGE

S. No.	Sex	Age group	No. Of Subjects	Total Subjects (53)	Percentage (%)
1	Male	18-20	10	28	52.83
		21-24	18		
2	Female	18-20	17	25	47.17
		21-24	08		

TABLE NO. 2: NO. OF HYPER-REACTOR SUBJECTS

Category	Male Subjects (28)	Female Subjects (25)	Total Subjects (53)	Percentage
Hypo-reactors	16	17	33	62.27 %
Hyper-reactors	11	09	20	37.73%

TABLE NO. 3: TABLE CORRELATING HYPERTENSIVE FAMILY HISTORY WITH HYPER-REACTIVITY

S. No.	Type of Case	Total No. of Case	Hyper-reactors		Hypo-reactors	
			No.	%	No.	%
1	Subjects of normal parents	40	12	30	28	70
2	Subjects of Hypertensive parents	13	8	61.54	5	38.46

TABLE NO. 4: COMPARISON OF PULSE RATE & RESPIRATORY RATE IN THE HYPER-REACTOR SUBJECTS BEFORE AND AFTER 3 MONTHS OF YOGA.

S.No.	Parameters	Before Yoga		After 3 months of Yoga		Difference between initial and final mean value	P- Value
		Mean Value	S.D.	Mean Value	S.D.		
1	Pulse Rate (per Minute)	79.45	5.11	75.4	4	4.05	(p <0.000)
2	Respiratory Rate (per minute)	19	1.97	17.15	1.56	1.85	(p< 0.000)

TABLE NO. 5: BASAL BLOOD PRESSURE (BEFORE INTERVENTION) AND EFFECT OF COLD STRESS ON BASAL BLOOD PRESSURE WITH THEIR MEAN VALUE & STANDARD DEVIATION.

S.No.	Subjects	Blood Pressure	Basal Blood Pressure before Suryanamaskar		Rise in B.P. due to Cold Stress	
			Mean Value	S. D.	Mean Value	S. D.
1	All Hyper-reactors (20)	Systolic	116.2	6.45	20.7	4.21
		Diastolic	74.50	4.85	12.8	4.17
2	Systolic Hyper-reactors (11)	Systolic	116.36	5.57	21.09	1.04
		Diastolic	75.27	5.53	9.45	2.20
3	Diastolic Hyper-reactors (4)	Systolic	113.5	4.72	14	3.65
		Diastolic	72.00	4.00	16.5	1.00
4	Both Systolic & Diastolic Hyper-reactors (5)	Systolic	118	9.59	25.2	1.09
		Diastolic	74.8	3.89	17.2	1.09

TABLE NO. 6: CHANGES IN THE BLOOD PRESSURE DURING COLD PRESSOR TEST IN HYPER-REACTORS BEFORE AND AFTER 3 MONTHS YOGA.

S.No.	Parameters		Before Yoga		After 3 months of yoga		Difference between initial and final mean Value	P- Value
1	Blood Pressure (mm Hg)		Mean Value	S. D.	Mean Value	S. D.		
2	Basal B. P.	Systolic	116.2	6.45	113.1	5.29	3.1	(p <0.002)
		Diastolic	74.5	4.85	72.4	3.92	2.1	(p <0.011)
3	**B.P. after Hand dip in 4^0 C water for 1 min.**	Systolic	136.4	8.91	128.6	6.80	7.8	(p <0.007)
		Diastolic	87.3	4.99	81.5	4.53	5.8	(p <0.000)
4	**Rise in Blood Pressure**	**Systolic**	20.7	4.21	15.5	4.04	5.2	(p <0.000)
		Diastolic	12.8	4.17	8.9	2.46	3.9	(p <0.000)

DISCUSSION

Age: In the study the age of subjects ranged from 18 to 24yrs. Age group 18-20 yr included 27 subjects (51 %) and 21 to 24 yr included 26 subjects (49%).

Sex: In the study both males and females were included and out of 53 subjects 28 (52.83 %) were males and 25 (47.17 %) were females.

Pulse Rate: In the present study average pulse rate of hyper-reactors before suryanamaskar was 79.45 ± 5.11 per min. and after suryanamaskar it reduced to 75.4 ± 4.0 per min. with a p value of <0.001 which is statistically significant.

These findings correlate with-

Sahoo J K; Vatve M et al (2010) also found significant decrease in pulse rate. Initially it was 78.19 ± 8.5, and it become 74.59 ± 4.62 per min after 4 months of specific yogasanas, with significant p value ($p<0.001$)[19].

Shamina Malik, Mohsin Shah et al (2011) also found significant decrease in pulse rate. Initially it was 83.6 ± 11.1, and it becomes 72.4 ± 11.4 per min after 3 months of yogic breathing techniques. The decrease in pulse rate was probably due to increased vagal tone together with decreased sympathetic discharge[20].

Respiratory Rate: In the present study we found a significant decrease in respiratory rate. Initial respiratory rate in hyper-reactors was 19 ± 1.97, per min and it decreased to 17.15 ± 1.56 per min. This decrease is statistically significant with p value < 0.001.

Blood Pressure changes: Initially the mean systolic BP of hyper-reactors subject was 116.2 ±6.45 mm Hg which decreased after 3 months of yoga to 113.1 ± 5.29 mm Hg and diastolic pressure initially which was 74.5 ± 4.85 mm Hg became 72.40 ± 3.92 mm Hg.

Pratima M. Bhutkar, Milind V. Bhutkar, Govind B.Taware, Vinayak Doijad and B.R. Doddamani1 (2008) -Studied the effects of regular practice of Suryanamaskar on resting B.P. and Pulse Rate. It was observed that the resting B.P. and Pulse Rate were reduced Statistically significant (0.0001) and the cause of decrease resting B.P. and Pulse Rate attributed to increased vagal tone and decreased sympathetic activity[21].

Shamina Malik, Mohsin Shah et al (2011) also found significant decrease in BP with initial mean value of SBP 127.7 ± 9.2 mm Hg, which decreased to 119.1 ± 8.8 mm Hg after practicing yoga. The DBP was 81.9 ± 8.8 mm Hg & after practicing yoga, pranayama the DBP decreased to 80.0 ± 7.1 mm Hg[20].

CONCLUSION

So, from above study it can be concluded that yogic postures are now, one of the non-pharmacological therapies against stress and strain. Yoga practice has been shown to be effective in improving mood and decreasing stress and depression. (Woolery A, Myers H, Stemlieb B, Zeltzer L. 2004)[22].

There are numerous references of praising the Sun for the purpose of good health and prosperity. Physical prostration to Sun, showing complete surrender of oneself to God, is the main aspect of these procedures.

Conflict of Interest- Nil

Source of Funding- Self

Ethical Clearance- Yes

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Determinants of Anaemia among Adolescents in Rural Nalgonda

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ABSTRACT

Prevalence of anemia has been adequately studied in India but there is need to study temporal changes in prevalence, its determinants, especially during adolescence - a phase of rapid growth life, under '*continuum of care*' concept. The present study quantifies the prevalence, severity and type of anemia among school attending adolescents of rural Nalgonda, and identify socio-demographic, cultural and nutritional factors related with the anemia. 353 healthy subjects between 11-19 years of age were included. Data was collected on structured questionnaire through face-to-face interview and compiled on *Windows EXCEL*. Appropriate statistical tests of significance were applied to identify associations and results tabulated. Age, gender, blood group, handwashing and type of house had significant association with prevalence of anaemia in the present study. Factors such as religion, mother's education, family size, social class, use of footwear, type of family, BMI, method of excreta disposal, type of diet, drinking water source did not show significant association with prevalence of anaemia.

Keywords: *Anaemia, Adolescence, Rural, Education, BMI, per capita income, Behavioural & Environmental characteristics.*

INTRODUCTION

Anemia is an important global public health problem. WHO estimates that 1.62 billion people globally are affected with anemia which corresponds to 24.8% of the world population[1]. The burden of anemia is disproportionately borne among children in developing countries.[2] Adolescence is the period of transition between childhood and adulthood which is characterized by exceptionally rapid rate of growth exceeded only by intrauterine life and early infancy[3]. Studies have shown that prevalence of malnutrition and anaemia is high in these age groups[5,6,7]. The present study determines the prevalence, severity and type of anemia among school attending adolescents of rural Nalgonda, and identifies possible socio-demographic, cultural and nutritional factors related with the anemia at community level.

MATERIAL & METHOD

Study Setting: Schools in randomly selected villages in Rural Health Training Centre (RHTC) of KIMS, Narketpally.

Study-design: Cross sectional study.

Sample size: Based on prevalence of anemia reported by NFHS-3 (Girls-55.8%, Boys-30.2%, Mean-43%), sample size for the study has been calculated as under:-

$n=Za^2*p*(1-p)/L^2$

Za=value for level of significance. 1.96, say 2 for 95%

p=prevalence. Taken 40% for calculation

L= precision. Taken as 15% of p i.e.6%

n=4*40*60/6*6=267+10% for non-consenting=293(say 300)

353 apparently healthy subjects (209 females; 144 males) aged 11–19 years were included in the study.

Data Collection: Data was collected on a structured questionnaire through face-to-face interview which was piloted prior to the start of the study. A detailed demographic profile of every participant i.e. age,

sex, religion, type of family, type of house, family size[24], income and education of parents was collected. Information regarding relevant hygiene practices (footwear use, handwashing, source of drinking water and method of excreta disposal) and diet history was obtained by the investigator. Weight was recorded using a portable digital scale, and calibrated-fixed base-portable scale was used for measurement of height. Body Mass Index (BMI) was calculated and classified[26].

Anaemia was diagnosed and classified as per WHO guidelines[23]. Socio-economic status was identified based on per capita income as per revised B.G Prasad's social classification.[13]

Adolescents whose mothers had their education upto fifth standard or below were grouped together, while those with education more than sixth standard but lesser or equal to twelfth standard were classified into a separate group. The third group included mothers educated above twelfth standard.

Laboratory Support: Venous blood samples were collected in appropriate vacutainers and transported to central laboratory within two hours of collection. Hemoglobin levels were estimated by counter based colorimetry method. Packed cell volume (PCV) and total red blood cell count (RBC) were detected using automatic cell counter (Mindray 3-part). Mean corpuscular volume (MCV) was calculated by computer programme and type of anemia was diagnosed based on normal limits (MCV 78-96fl)[25]. Blood groups were determined by Slide method using 'lifeclone' antisera.

Data Compilation and Analysis: Data was compiled on *Windows-EXCEL*. Appropriate statistical tests of significance were carried out to identify associations and results tabulated.

Results: The prevalence of anaemia was 30.5% (95% CI 25.79 -35.39) (108 subjects) of which 106 subjects (98.15%) had Microcytic anaemia.

Age: The difference in age distribution of anaemia in study population was found to be statistically significant (p=0.02*).

Sex: Anemia was found to be more common in female adolescents. This association of gender and anaemia was found to be statistically significant (p=0.002*).

Family size: Families comprising four or less members showed lesser prevalence of anaemia as compared to families with more than four members. However, this difference was not statistically significant (p=0.234).

Education of mother: Anemia was not significantly different among adolescents whose mothers were less educated as compared to adolescents with literate mothers (p=0.289).

Social class: It was found that the difference in prevalence of anemia among various social groups in the study sample was not statistically significant (p=0.288).

Type of family: Out of 353 subjects studied, 281 belonged to nuclear family and 72 belonged to joint family. The difference in prevalence of anaemia was not statistically different (p=0.720).

Blood Groups: The distribution of the subjects with different blood groups followed the order O>A>B>AB (162: Group O; 85: Group A; 82: Group B; 24: Group AB). However, prevalence of anaemia in different blood groups followed the order O>B>A>AB. The difference in prevalence was found to be statistically significant (p=0.008*).

BMI: It was shown that 32.4% of underweight, 27.3% of overweight, 33.3% of obese and 28.8% of normal subjects were found to be anaemic (p=0.690).

Footwear use: The association between anaemia and using footwear was not statistically significant (p=0.790).

Washing of Hands: It was found that among subjects having anaemia (108), 71 washed hands after using toilet as well as before consuming food, 17 washed hands only before having food and 19 washed hands only after toilet use. The difference in hand washing habits among anaemics and non-anaemics was statistically significant (p<0.001*).

Type of House: About 54.6% of anaemics lived in kutcha houses. The difference in prevalence of anemia was associated with type of house that adolescents lived in (p<0.001*).

Toilet Facilities: The difference between type of toilet facilities and prevalence of anaemia was not statistically significant (p=0.814).

Drinking water: The difference between source of drinking water and prevalence of anaemia was not statistically significant (p=0.837).

Table: **Relation between observed parameters and Anaemia (n=353)**

Characteristics	Variable	Anaemia	Non Anaemia	'p' Value
Age	12	3 (33.3%)	6(66.7%)	p=0.02*
	13	22(26.9%)	60(73.1%)	
	14	40(32.3%)	84(67.7%)	
	15	33(30%)	77(70%)	
	16	2(14.3%)	12(85.7%)	
	17	0(0%)	4(100%)	
	18	6(75%)	2(25%)	
	19	2(100%)	0(0%)	
Sex	Females	77(36.8%)	132(63.2%)	p=0.002*
	Males	31(21.5%)	113(78.5%)	
Family size	≤4	49 (27.7%)	128 (72.3%)	p=0.234
	>4	59 (33.5%)	117 (66.5%)	
Education of Mother	Less than Fifth standard	77 (32.9%)	157 (67.1%)	p= 0.289
	Secondary or High School	14 (22.6%)	48 (77.4%)	
	Higher than 12th standard	17 (29.8%)	40 (70.2%)	
Social Class	Upper	11(32.4%)	23(67.6%)	p=0.288
	Upper middle	18(22.8%)	61(77.2%)	
	Middle	35(35.7%)	63(64.3%)	
	Lower middle	32(28.6%)	80(71.4%)	
	Lower	12(40%)	18(60%)	
Type of family	Nuclear	88(31.3%)	193(68.7%)	p=0.720
	Joint	20(27.8%)	52(72.2%)	
Blood Group	O	53(32.7%)	109(67.3%)	p=0.008*
	A	21(24.7%)	64(75.3%)	
	B	30(36.6%)	52(63.4%)	
	AB	4(16.7%)	20(83.3%)	
BMI	Under weight	57 (32.4%)	119 (67.6%)	p=0.690
	Normal	43 (28.8%)	106 (71.2%)	
	Over weight	6 (27.3%)	16 (72.7 %)	
	Obese	2 (33.3%)	4 (66.7%)	
Footwear use	Yes	104(30.8%)	234(69.2%)	p=0.790
	No	4(26.7%)	11(73.3%)	

Cont... **Table**: **Relation between observed parameters and Anaemia (n=353)**

Washing of hands	After meals only	0(0%)	1(100%)	p= <0.001 *
	Both after using toilet and before meals	71(27.5%)	187(72.5%)	
	Before meals only	17(47.2%)	19(52.8%)	
	After using toilet use only	19(33.3%)	38(66.7%)	
	None	1(100%)	0(0%)	
Type of house	Kutcha	59(44%)	75(56%)	p=<0.001 *
	Pukka	49 (22.4%)	170 (77.6%)	
Toilet Facilities	Concrete	92 (30.4%)	211 (69.6%)	p=0.814
	Open	16 (32%)	34 (68%)	
Drinking water source	Improved	87 (30.6%)	197 (69.4%)	p=0.837
	Non improved	21 (30.4%)	48 (69.6%)	

*p value < 0.05 considered statistically significant

DISCUSSION

The prevalence of anaemia in present study was 30.5% (Females 36.8%; Males 21.5%) (Every 3rd school adolescent was anaemic) indicating mild public health importance. The present prevalence rate is similar to NHS-3 (2005-06) where prevalence of anemia was higher among girls (55.8%) (girls aged 15-19yrs) and 30.2% (boys aged 15-19yrs)[4].This difference of prevalence in the gender can be attributed to factors like menstruation or preference in feeding practices towards male child at home for meeting micro nutrient requirements which is commonly noticed in rural settings. Nutritional inadequacies may also impair immunity which in turn can have associations with anaemia[2]. No similar study from this area was available to make direct comparisons.

The high prevalence of microcytic hypochromic anaemia (98.15%) may be attributed to iron deficiency in adolescents because of rapid growth, hormonal change as well as menstruation in girls. This finding is in line with similar studies carried out among Turkish and American adolescents [9, 10].

Family size

Larger family size was not associated with higher prevalence of anaemia. These findings could be different from other studies[16 17] probably due to different socio-cultural factors.

Education of mother

School adolescents with less educated mothers were commonly anaemic as compared to adolescents with better educated mothers[16]. This could be attributable to informed decision making, probably better jobs and thus a healthier dietary behavior among better educated mothers.

Socio economic class

Children of the rich and middle class households (B.G.Prasad class I-III) had trend towards lower prevalence of anaemia compared to the poorer households (B.G.Prasad class IV-V) plausibly due to improved nutritional status. This finding is consistent with previous studies[14 15].

Type of family

A higher proportion of anaemic adolescents belong to a nuclear family when compared to a joint family.

However this difference was not statistically significant as in noted other studies[19 20].

Blood groups

A relation between prevalence of Anaemia and blood group was noted. The prevalence of anaemia was higher among subjects with group O (32.7%) which is similar to the previous findings[17].

BMI

The prevalence of anaemia was non-significantly different in students who were underweight as compared to the normal and overweight students (p=0.690). This finding is in agreement with observations made by Leite MS et al[11], Bekele Gutema et al [8] and Tatala SR et al[12].

Washing of hands

Handwashing habits were significantly different between anaemic and non-anaemic adolescents studied. It was observed that 27.5% who had the habit of washing hands after using toilet as well as before having meals had anaemia in comparison to 33.3% (after toilet use only) and 47.2% (before having meals only)(p<0.001*). This association is consistent with recent findings of Bilkish N Patavegar et al[19]and Vankudre et al[21].

Diet

Although literature indicated that there was an association between prevalence of anaemia among female adolescents with frequency of meat consumption[21], no statistical association between dietary habits and prevalence of anaemia was observed in this study. These findings were similar with the studies conducted by Bilkish N Patavegar *et al* [19] and Vankudre *et al* [21].

Type of House

Among the anaemic adolescents of the present study, subjects residing in kutcha houses were 44% as compared to 22.4% of anaemic adolescents residing in pakka houses. Tests of significance were applied and found to be significantly associated. The findings were similar to the previous studies[21].

Toilet

The hygiene conditions of adolescents were assessed. It was found that excreta disposal either in the form of use of concrete latrine or open air defecation had no association with anaemia. It is similar to study done by Bilkish N Patavegar *et al*[19].

Drinking water source

The prevalence of anaemia among adolescents who consumed water from improved source was 30.6% as compared to 30.4% among adolescents who consumed water from non-improved source. There was no significant association. However, it is in contrast to findings of Jahidur Rahman Khan et al[2] where there was a significant difference of anaemia prevalence between children from households with access to improved water source (51.1%) and those without such access (74.3%).

LIMITATIONS

While the data collection was designed to be representing the rural population of Nalgonda, there could be some degree of bias in the sampling as only government school going students were considered. This limits the insights that can be drawn from the data.

Owing to the cross sectional study used, whether anaemia preceded the predisposing factors or the vice versa could not be verified in the study.

CONCLUSION

353 adolescents of rural Nalgonda have been studied for association of anaemia with demographic, socio-economic, biological and environmental factors. 108 were found to be anaemic (77 females, 31 males). Age, Gender, Blood group, Handwashing and type of house had significant association with prevalence of anaemia in the present study. Factors such as religion, education of the mother, size of family, social class, use of footwear, type of family, BMI, method of excreta disposal, type of diet, drinking water source did not show significant association with prevalence of anaemia.

Conflict of Interest: No potential conflict of interest exists.

Source of Funding: Indian Council of Medical Research, Delhi and Kamineni Institute of Medical Sciences, Narketpally, Telangana.

Ethical Clearance: Institutional ethical clearance was obtained. Informed consent was taken from all the participants and their guardians after explaining the

objectives of the study to each one of them. All the data was kept confidential using a unique code number.

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Evaluation of Babinski Reflex in Neonates

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ABSTRACT

Babinski reflex (BR) is one of the infantile reflexes. Most newborn babies are not neurologically mature and therefore show a BR. Upon stimulation of the sole, they dorsiflex the great toe smaller toe will fan out. Objective of our study was to evaluate the Babinski reflex in neonates. Study was conducted on 458 neonates, babies of either sex which were categorised as preterm 120, Term SGA 123, Term AGA 215. Their plantar response was assessed using thumb nail drag method. The response was graded as flexor, extensor, equivocal and asymmetrical. Plantar response was recorded as in preterm AGA extensor 75%, flexor 5%, equivocal 8.3% and asymmetrical 11.7%. In term SGA extensor 61.8%, flexor 9.8%, equivocal 13%, asymmetrical 15.4%. In term AGA extensor 61.9%, flexor 12.1%, equivocal 14.9%, asymmetrical 11.2%. Study showed predominant extensor response in neonates. p value was 0.11.

Keywords: *Babinski reflex, Plantar Reflex.*

INTRODUCTION

Extensor plantar reflex or Babinski reflex is upon stroking the sole producing extension (dorsiflexion) of the big toe, often with extension & abduction (fanning) of the other toes. This abnormal response is termed Babinski reflex or Extensor plantar reflex.[1]

The plantar reflex, which is one of the most frequently tested reflexes in clinical neurology[2], is elicited to assess the integrity of corticospinal pathways[3]. In healthy adults the plantar reflex is usually flexor, but it usually becomes extensor following lesions of the corticospinal pathway[4]. Babinski reflex also known as Plantar reflex (PR), is a polysynaptic superficial reflex, designed to withdraw the stimulated part i.e. the foot from a potentially dangerous stimulus[5]. Babinski's reflex is one of the infantile reflexes. Most newborn babies are not neurologically mature and therefore show a Babinski reflex. Upon stimulation of the sole, they dorsiflex the great toe and smaller toes will fan out. As the child ages the nervous system becomes more developed, PR may disappear as early as 12 months but it may be found upto 2 years of age. Presence of BR after 2 years of age is a sign of damage to the corticospinal tract. This tract runs down on both sides of spinal cord, so babinski's reflex can occur on one side or on both sides of the body[6].

In healthy newborns, however the reflex has been reported to be extensor in most studies. This changes to flexor response by six to twelve months of age.

MATERIAL & METHOD

The study was Conducted in department of physiology in collaboration with Department of Pediatrics at Rama Medical College and Research Center, Mandhana Kanpur.

This study was conducted to test Babinski's reflex in 0-1 month of age.

458 neonates of either sex were taken.

To compare the plantar reflex in preterm AGA, Term AGA and Term SGA.

Inclusion Criteria

1. Subjects were included from indoor as well as outdoor.
2. Neonates (upto 1 month).
3. Preterm AGA* (<37 weeks Gestational age)
4. Term AGA (37 weeks to < 42 weeks Gestational age)

5. Term SGA** (37 weeks to < 42 weeks Gestational age)

(* Appropriate for gestational age, ** Small for gestational age)

Exclusion Criteria

- Severe respiratory distress (Silverman Score >5)[7],
- Birth asphyxia/ HIE, APGAR[8] <5 at 1 min ,<8 at 5 min or H/O delayed cry after birth.
- convulsion, kernicterus, major congenital anomalies, Neurological deficit
- H/o Repeated admission

Method : Lateral aspect of the sole rubbed with blunt but non-noxious stimuli so that it does not cause injury, pain and discomfort to skin. Stimuli beginning at the heel sweeping upward to the level of metatarsal but avoiding the base of the toes. Thumbnail drag method was used.

The babies were examined supine with the knee held in extension in both feet.

Plantar reflexes were coded as:

a) Flexor:- Flexion of great toe (plantar flexion) constituted flexor response.

b) Extensor:- Extension of great toe (dorsiflexion) constituted extensor response.

c) Equivocal:- No movement or bidirectional movement of great toe constituted equivocal response.

d) Asymmetrical:- Both limb showed different plantar reflex.

study design cross sectional

Statistical analysis by Matched Chi^2 test .

Total 458 subject were enrolled-

- Term AGA= 215
- Term SGA= 123
- Preterm = 120

AIMS AND OBJECTIVES

The present study was conducted to test Babinski's sign in neonates.

To compare plantar reflex in preterm appropriate for gestational age, term appropriate for gestational age and term small for gestational age.

RESULTS

Table 1. Number of cases in different categories

Category	number of cases	Percentage
Preterm	120	26.2
Term SGA	123	26.86
Term AGA	215	46.94
Total	458	100

Table 2. Mean Gestational age (weeks) and standard deviation in different categories

Category	Gestational Age(weeks)
Preterm	34.81 ± 1.33
Term SGA	38.80 ± 1.09
Term AGA	39.22 ± 3.00

In preterm mean gestational age was 34.81 weeks with standard deviation of 1.33 weeks. In Term SGA mean gestational age was 38.80 weeks with standard deviation of 1.09 weeks. In Term AGA mean gestational age was 39.22 weeks with standard deviation of 3.00 weeks (Table No. 2)

Table 3. Mean Birth weight and standard deviation in different categories

Category	Birth weight (Kg.)
Preterm	1.73 ± 0.11
Term SGA	2.08 ± 0.20
Term AGA	2.47 ± 0.29

In preterm mean birth weight was 1.73 kg with standard deviation of 0.11 kg. Term SGA mean birth weight 2.08 with standard deviation of 0.20 kg. Term AGA mean birth weight 2.47 kg with standard deviation of 0.29 kg. (table 3)

Table 4. Showing plantar response in different categories

Plantar response	Preterm (n=120)	Term SGA (n=123)	Term AGA n=(215)	P value
Extensor	90 (75)*	76 (61.8)	133 (61.9)	0.11
Flexor	6 (5.0)	12 (9.8)	26 (12.1)	
Equivocal	10 (8.3)	16 (13.0)	32 (14.9)	
Assymetrical	14 (11.7)	19 15.4)	24 (11.2)	

***Values in parenthesis indicate percentage**

Chi square =10.25

P value = 0.11

Plantar responses in neonates were predominantly extensor. Extensor responses were 13% more in preterm compare to term baby although it was not statistically significant. Extensor responses in preterm, term SGA, term AGA were 75%, 61.8%, 61.9% respectively, flexor response in preterm, term SGA, term AGA were 5%, 9.8%, 12.1% respectively, equivocal response in preterm, term SGA, term AGA were 8.3%, 13%, 14.9% respectively, asymmetrical response in preterm, term SGA, term AGA were 11.7%, 15.4%, 11.2% respectively (Table No. 4).

DISCUSSION AND CONCLUSION

This study shows high incidence of extensor plantar response in newborns.

Preterm babies had 13 percent more incidence of extensor response as compared to term babies as their corticospinal tracts are probably even more immature. But it was statically insignificant ,p value 0.11.

There was no significant difference in plantar response in term appropriate for gestational age and term small for gestational age babies.

Gingold et al [9] found no statistical significant difference in preterm infants when compared the plantar response between them. In our study we found extensor response was 13% more in term babies compared to preterm babies , but the difference was not statistically significant, so our results also correspond to it.

Oluwole O.Steven et al[10] Conducted a study to determine the incidence of extensor plantar reflex in newborns in an indigenous population in Africa and found that low incidence of extensor PR . Ronald S Illingworth[11] has demonstrated that plantar response was almost invariably flexor in term infants if done by proper technique.

Gupta et al [12] found predominant extensor response in healthy term neonate. Kumar et al[13] concluded that normal plantar response is predominantly extensor in early infancy, the transition to flexor response starts occurring after six months of.age. Several aspects of the plantar reflex that have accounted for much of the confusion in early studies can be cleared up when one attends to the physiological basis of plantar response.

So according to my study plantar response is predominantly extensor in preterm, term (preterm > term).

Source of Funding – Self.

Conflict of Interest – None.

Ethical Clearance: Taken from the ethical committee of the college.

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A Study on the Relationship between Basocytopenia and Ovulation

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ABSTRACT

Background: Most common cause of female infertility is ovulatory problem. Lack of visible manifestations of ovulation , makes it difficult to predict for couples trying to conceive. Several signs of ovulation like change in basal body temperature, spinbarkeit, are identified by researchers. Tests like transvaginal ultrasonography, fern test are also present to detect ovulation. A study was done , which identified an obvious relationship between basophil count and ovulation. **Aim** : The Aim of the present study is to prove that Absolute basophil count decreases during ovulation and it would return back to normal in luteal phase of an ovulating menstrual cycle. So that, Absolute basophil count test can also be used to predict ovulation. This would be of great significance to couples suffering with infertility. **Material & method:** 140 female subjects who were 18-25 year old , with regular menstrual cycles were chosen for this study. Their day of ovulation is calculated depending on the duration of menstrual cycle. The day of ovulation is confirmed using transvaginal ultrasonography. Absolute basophil count (ABC) was done using Thick smear method of S.Roger Hirsch & Alfred A.Rimm The basophils were then manually counted under oil immersion objective of the microscope. The basophils were counted in the follicular phase, one day before ovulation, day of ovulation and in the luteal phase. Statistical differences were calculated using ANOVA Test. Results : A statistically significant fall in absolute basophil count was observed during ovulation. In the follicular phase, the mean basophil count was 32.9 cells/cumm +/- 4.2,One day before ovulation , 26.94 cells/cumm+/- 2.9, on the day of ovulation 20.84 cells / cumm +/- 2.3, in the luteal phase 36.5 cells/cumm +/- 5.6 with P value <0.05. **Conclusion** : we conclude that the absolute basophil count decreases during ovulation. This should be further researched upon and can be used as an easy, inexpensive test to confirm ovulation, to prevent infertility.

Keywords *: Basophil count, Ovulation, Infertility.*

INTRODUCTION

Infertility is a common problem of women aged 20 to 40 years .

Risk factors(1) for women's infertility include ovulation problems, blocked Fallopian tubes, uterine problems, uterine fibroids, age, stress, poor diet.

Most common female fertility tests include Hysterosalpingogram, Laparoscopy, Hysteroscopy, Saline hysterogram, Endometrial biopsy, Cervical mucus test , postcoital test & ovulation tests.

Several tests exist to evaluate a woman's ovarian function.No single test is a perfect predictor of fertility due to the lack of obvious visible manifestations of ovulation in human females . ovulation occurs on 14th day of a regular 28 day menstrual cycle. The ovulation time can be determined by indirect methods like basal body temperature, free hormones like estrone, oestradiol in urine, cervical mucus tests, free hormone levels of FSH, LH, estrogen, progesterone in plasma and by ultrasound scanning the process of ovulation. Female facial attractiveness(2) also increases during fertile period of the menstrual cycle.

Researchers have actually confirmed that Basopenia(3) can also be used as an indicator of ovulation. So Absolute basophil count, an inexpensive, not too invasive test must be researched upon, so that it can be used to determine the fertile period in menstrual cycle.

The Absolute basophil count[4] is determined by manual counting of peripheral blood smears, cell-counting chambers, automated hematology analyzers and fluorescence flow cytometry.

Basophils are the least numerous of leukocytes forming less than 1% of the total leukocytes. They are around 8-10 micrometers in diameter. The nucleus is bilobed . The cytoplasm contains coarse granules which take up basophilic stain.Granules fill the cell and obscure the nucleus. Basophils remain in blood for a short duration and later migrate to the tissues. Basophils involve in the healing process. Substances released from basophils are heparin, histamine[5], slow reacting substance of anaphylaxis, bradykinin, serotonin, Proteases and myeloperoxidases. Cytokine such as interleukin-8 [6] increases the inflammatory responses and kill the invading organisms.

The current research is done to gain knowledge on the role of basophils in ovulation. So that, the Basophil count can be used as a predictor of ovulation in infertility cases.

MATERIALS AND METHOD

A total of 140 subjects chosen for this study were 18-25 year old females, with regular menstrual cycles, were selected randomly. Subjects who have undergone any gynaecological invasive procedures or subjects with irregular menstrual cycles or reported infertility were all excluded from this study. All the subjects were explained about the research protocol and their consent both for the Absolute basophil count and transvaginal ultrasonography was taken.

Their day of ovulation is calculated depending on the duration of menstrual cycle. The day of ovulation is confirmed using transvaginal ultrasonography. Ultrasound scans were done on 5 th day, 10th day (follicular phase), one day before ovulation, day of ovulation and 25th day (luteal phase) of menstrual cycle. The mean follicular diameters were observed and the ovulation was detected when there was a line of decreased reflectivity around the follicle and a crenation pattern within the follicle was observed, confirming the follicular rupture.

We have followed Thick smear method [7] of S. Roger Hirsch & Alfred A.Rimm. A sterile prick of 3 mm is given. A Thick smear is taken on a glass slide, allowed the smear to dry. The smear was fixed with methanol and stained with toluidine blue. The basophils were then manually counted under oil immersion objective of the microscope. The basophils were counted in the follicular phase, one day before ovulation, day of ovulation and in the luteal phase.

Statistical analysis:

Data was entered into excel sheet analyses with SPSS software version 24 and ANOVA test was applied.

LIMITATIONS OF THE STUDY

The limitations of Manual basophil counting of peripheral blood smears are distribution, observer, and statistical errors.

RESULTS

Mean basophil count/cumm

Follicular phase	One day before ovulation	Day of ovulation	Luteal phase	P value
32.9 cells/cum	26.94 cells/cumm	20.84 cells/cumm	36.5 cells/cumm	< 0.05
SD 4.2	SD 2.9	SD 2.3	SD 5.6	

The table above shows the mean basophil count/ cumm in different phase of menstrual cycle. It is clearly observed that the mean basophil count shows a statistically significant decrease, along with the various phases of menstrual cycle. P value being < 0.05.

The ultrasound findings of follicular study are as follows. A serial scanning starting from the the 5th day of cycle, using transvaginal scan to assess the follicular growth, endometrial changes and free fluid in pelvis (pouch of douglas).

Scan on the 5th day showed no dominant follicles, trilaminar endometrium, no freefluid in pelvis. Scan on 10th day showed a dominant follicle in either one of the ovary, trilaminar but thickened endometrium, with no fluid in the pelvis. One day befor ovulation, the dominant follicle increased to a size of 1.8-2.5cms, endometrial thickness gradually increased, with no fluid in the pelvis.

On the day of ovulation, a line of decreased reflectivity around the follicle and a crenation pattern within the follicle was observed, confirming the follicular rupture. Mean follicular diameter was 20.7 +/- 0.6 mm. ovulation was ascertained using cumulus oophorus. The apical wall thinned to nondetectable limit during rupture.

Scan after ovulation in the luteal phase, showed homogenous endometrium with crumpled follicles and free fluid in pouch of douglas.

Mean, standard deviation were calculated. P value calculated with appropriate statistical tools. ANOVA test was applied to determine whether the results were significant . The results were statistically significant. A statistically significant difference between different phases was observed.

P value < 0.05 was considered significant.

DISCUSSION

The timing of ovulation by a method of Absolute basophil cells count, have confirmed that there is a precipitous decrease in the basophil count, during ovulation. Our study is consistent with the study of Liselotte Mettler. [9]

It's a natural tendency of leukocytes to get attracted to the site of inflammation through chemotaxis, caused by several inflammatory mediators. Regarding the presence of basophils near the site of ovulation, they are involved in tissue modeling occurring at ovulation.

[10] Brann strom, etal have confirmed the same in their research on localization of leucocytes subsets in the follicle wall and in the corpus leteum through out the human menstrual cycle.

Espey IL[11] have also confirmed that Ovulation is an inflammatory reaction. They have observed that basophils accumulate around even before the rupture of follicle, which confirms that, some chemotactic substances like prostaglandins are produced to attract the basophils to the site of ovulation. These basophils release histamine and proteolytic substances llike collagenase, elastase, plasminogen activator and nonspecific proteases, which cause rupture of the follicle to release ovum.

Cindy zhou etal[12], in their research on ovarian expression on chemokines and their receptors, have confirmed the involvement of immune system in ovulation.

Interleukin –1[13], a potent chemoattractant activating fator and angiogenic agent , may be important modulator of leukocyte chemotais in oulatory function, such as timely follicular rupture. (Nakamura)

Low Interleukin-6 [14, 15] concentrations (a potent chemoattractant of basophils) are associated with negative outcome in invitro fertilization treatment. (Mohamed Bedaiwy)

Morphological studies[16] of the microcirculatory system of periovulatory ovine follicles have shown that Basophils,migrate out of the vascular compartment before ovulation. Extravasated leukocytes accumulate not only to release proteolytic enzymes for rupture but also are associated with the development of new capillaries during luteinization.

CONCLUSION

In summary, the present study identifies, a decrease in the basophil count during ovulation. This strongly supports the role of basophils in ovulation. So, more research should be done on basophils, to prevent infertility.

No relevant conflict of interest is present this study was done in Katuri medical college, which funded the entire tests. The study was started only after obtaining the ethical committee clearance.

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Influence of Short Term Yoga Retreat on Stress and Anxiety Levels in Patients Suffering from Psychosomatic Disorders

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ABSTRACT

Psycho-somatic illnesses lead to stress and anxiety. Yoga and meditation have been known to combat them. This study was designed to investigate the influence of short term yoga therapy on stress and anxiety levels in people suffering from psycho-somatic illnesses. 100 diagnosed patients suffering from various ailments coming to SVYASA for yoga therapy were enrolled in the study. All subjects underwent short term Integrated Approach to Yoga Therapy (IAYT) according to their ailments in different departments of SVYASA. They were supposed to fill Spielberger's state trait anxiety inventory (STAI) and Perceived stress scale (PSS) on the first day of admission and then after one week of therapy. There was a significant improvement in the stress and anxiety levels in all the subjects as analyzed by paired t test. Yoga is effective in keeping the stress and anxiety in check. So, it should be prescribed as a supplement to conventional therapy of a psychosomatic disease.

Keywords: *Yoga, Psychosomatic disorders, Stress, Anxiety*

BACKGROUND

In the Yoga Sutras, Yoga is defined as "union" of mind, body and spirit. Classically, Yoga is understood as the science of the mind. [1] Yoga is assuming importance in improving mental health and quality of life in the treatment of a number of disorders.[2] Several diseases affect a person's biopsychosocial functioning to a greater or lesser degree.[3] These diseases are known as psychosomatic diseases. Psychosomatic means mind (psyche) and body (soma). A psychosomatic disorder is a disease which involves both mind and body. There is a mental aspect to every physical disease. How one reacts to and copes with disease varies greatly from person to person. For example, a rash of psoriasis may not bother some people while it may make some feel stressed and more ill. These psycho-somatic illnesses are known to develop stress and anxiety in the sufferers.[4]

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Stress is a common condition-a response to a physical threat or psychological distress that generates a host of chemical and hormonal reactions in the body. The result of such a response to stress is physiological support for adaptive behaviours such as "fight or flight." As a part of the adaptive response to stress, various body systems such as the autonomic, cardiovascular, gastrointestinal, and immune systems may be affected.[5] Modern age man is under continuous stress and does not get time for relaxation. So, the degree or severity of stress increases in various psychosomatic ailments and contributes to anxiety. Anxiety is a psychological and physiological state characterized by somatic, emotional, cognitive and behavioral components. This anxiety may even worsen the quality of life in patients suffering from psychosomatic disorders.[6] So, there is a need to keep the stress and anxiety levels in check. Among the various approaches to reduce the level of stress and anxiety, yoga is the one that combines the physical elements of a healthy lifestyle with prescriptions for abiding mental peace.

AIMS AND OBJECTIVES

To study the effect of one week yoga therapy on anxiety levels and stress levels in patients suffering from

psychosomatic disorders.

METHODOLOGY

Sample size and Study period:

The study was done in SVYASA AROGYADHAMA, Bangalore in the month of July 2011. It was based on the data collected on 100 subjects who were diagnosed for psychosomatic ailments based on history and previous investigations and who attended Integrated Approach to Yoga Therapy (IAYT). Ethical clearance was obtained from Institutional ethical committee of SVYASA and written informed consent was obtained from all subjects. All subjects, more than 18 years of age and who understood English were included. Subjects from psychiatry section of AROGYADHAMA, who came for rehabilitation and who were severely ill, with complications and uncontrolled disease were excluded from the study. The subjects were a heterogeneous group, having hypertension, bronchial asthma coronary artery disease, diabetes mellitus, obesity, neurological disorder, chronic backache and arthritis and they were divided into different departments according to their ailments. In no subject, the physical condition prevented from participation in Yoga therapy.

The program

All subjects underwent IAYT, which included physical postures (Asanas), voluntary breathing (Pranayamas), meditation, internal cleansing processes (Kriyas) and lectures on practice of Yoga and derived special techniques in their respective sections. These procedures were offered daily and each session lasted for 1 h.

Study design

All subjects were given Spielberger's state trait anxiety inventory (STAI) and Perceived stress scale (PSS) to fill with no time limit and their doubts were cleared then and there on the first day of their admission and again after 1 week of Yoga practice at Arogyadhama.

The STAI is a validated 20 item self-reported assessment. Various reliability and validity tests have been conducted on the STAI and have provided sufficient evidence that the STAI is an appropriate and adequate measure for studying anxiety in research and clinical settings.

The Perceived Stress Scale (PSS) is the most widely used psychological instrument for measuring the perception of stress and consists of 10 items. It is a measure of the degree to which situations in one's life are appraised as stressful. Items are designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives.[7]

Data Extraction

STAI scores are calculated by reverse coding items 1, 2, 5, 8, 11, 15, 16, 19, 20 and adding all the items. It has a minimum score of 20 indicating least anxiety and maximum score 80 indicating highest anxiety levels.[8] PSS scores are obtained by reversing responses to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items. It has least score zero which indicates least perceived stress and maximum score 40 indicating highest perceived stress levels.[9]

Analysis: Data thus obtained was analyzed by paired t test.

RESULTS

The mean ± SD of age of the study group was 46.18 ± 16.58 years. About 55.3% of the subjects were females and rest 44.7% were males.

In the whole study group, there was a statistically significant improvement in both stress scores ($P < 0.001$) and anxiety ($P < 0.001$) with minor variations in patients of various departments [Table 1, 2] which are as follows:

A significant improvement was seen in stress scores as assessed by PSS scale in patients of all departments neurology/spinal disorders ($P< 0.001$), pulmonology/cardiology ($P < 0.001$), metabolic disorders ($P < 0.01$), endocrinology ($P < 0.001$), others (rheumatology/gastroenterology/promotion to positive health) ($P < 0.01$) as shown in Table 1. Similar results were observed when anxiety scores were assessed by STAI with statistically significant improvement seen in patients of neurology/spinal disorders ($P < 0.001$), pulmonology/cardiology ($P < 0.01$), metabolic disorders ($P < 0.01$), endocrinology ($P < 0.001$), others (rheumatology/gastroenterology/promotion to positive health) ($P < 0.01$) as shown in Table 2.

TABLE 1: Comparison of Stress Score before & after one week of yoga in different departments

Department	Number of subjects	Stress scores Mean ±SD		t value	P value
		Pre-yoga	Post-yoga		
Neurology/spinal	24	19.12 + 7.10	12.67+ 5.96	5.609	<0.001
Pulmonology/cardiology	16	15.81+ 5.62	10.56+ 3.79	5.599	<0.001
Metabolic disorders	14	17.36+ 4.80	10.00 + 3.79	4.236	<0.01
Endocrinology	29	16.55+6.86	12.41+ 5.95	4.075	<0.001
Others (Rheumatology, Gastroenterology, promotion of positive health)	17	16.65 + 4.24	14.18 + 4.47	3.052	<0.01
Total	**100**	**17.18 + 6.09**	**12.46 + 5.47**	**8.623**	**<0.001**

TABLE 2: Comparison of Anxiety Score before & after one week of yoga in different departments

Department	Number of subjects	Anxiety scores Mean + SD		t value	P value
		Pre yoga	Post yoga		
Neurology/ spinal	24	41.96 + 11.73	32.92 + 8.67	5.263	<0.001
Pulmonology/ cardiology	16	41.63 + 11.09	35.37 + 7.89	3.678	<0.01
Metabolic disorders	14	45.14 + 10.95	38.00 + 8.79	3.995	<0.01
Endocrinology	29	41.21 + 8.60	31.83 + 8.36	5.644	<0.001
Others (Rheumatology, Gastroenterology, promotion of positive health)	17	43.71 + 11.61	34.71 + 7.86	3.309	<0.01
Total	**100**	**42.43 + 10.53**	**34.01 + 8.43**	**9.807**	**<0.001**

DISCUSSION

The present study intended to investigate the effect of short term IAYT on stress and anxiety levels. The results showed that even a short term that is, just 7 days of Yoga practice significantly decreased both Stress and anxiety associated with concerned psycho somatic illness in the patients. These benefits were observed over a wide range of chronic diseases, which implies that Yoga intervention has an effect regardless of the diagnosis.

Yoga reduces stress-induced allostatic load in three stress reactive systems: the autonomic nervous system (ANS), the hypothalamic-pituitary adrenal (HPA) axis, and the GABAergic system.[10]

Yoga encourages one to relax, slow the breath and focus on the present, shifting the balance from the sympathetic nervous system and the flight or fight response to the parasympathetic system and the relaxation response. The latter is calming and restorative; it lowers breathing and heart rate, decreases blood pressure, lowers cortisol levels, and increases blood flow to the intestines and vital organs.[11]

The homeostatic interactions between the hypothalamus (H) and the pituitary (P) and adrenal glands (A) constitute the HPA axis that controls reactions to stress and regulates various body processes. Yoga leads to an inhibition of the posterior or sympathetic area of the hypothalamus. This inhibition optimizes

the body's sympathetic responses to stressful stimuli and restores autonomic regulatory reflex mechanisms associated with stress. Yogic practices inhibit the areas responsible for fear, aggressiveness and rage, and stimulate the rewarding pleasure centres in the median forebrain and other areas leading to a state of bliss and pleasure. This inhibition results in lower anxiety, heart rate, respiratory rate, blood pressure, and cardiac output in those practicing yoga and meditation

One of the main goals of yoga is to achieve tranquillity of the mind and create a sense of wellbeing, feelings of relaxation, improved self-confidence, improved efficiency, increased attentiveness, lowered irritability, and an optimistic outlook on life.[12]

Yoga practices which encourage mindful awareness increase acceptance and tolerance of emotions thereby improving emotional regulation and normalizing perceptions of stress.[13]

Yoga benefits are believed to be linked with the release of β endorphins and the shift caused in neurotransmitter levels linked to emotions such as dopamine and serotonin and indicate dominance of the parasympathetic nervous system.[14]

Yoga stimulates an under active parasympathetic nervous system and increases the inhibitory action of a hypoactive GABA system in brain pathways and structures that are critical for threat perception, emotion regulation, and stress reactivity.[10]

The results of the present study are comparable with other studies. A 30 min session of yogic stretching and breathing exercises produces a marked augmentation in perceptions of physical and mental energy. Such exercises also increase feelings of alertness and enthusiasm, and make subjects feel distinctly less sluggish and sleepy than before the session began. [15]Another study showed that short term yoga therapy improved not only the physical but also the mental composite scores and hence enhancing the overall quality of life in patients suffering from psychosomatic disorders.[16] Another study showed that a significant improvement on measures of stress and anxiety in women suffering from mental distress participating in a 3-month yoga class. [17]An integrated approach of yoga intervention modulated the stress and DNA damage levels in breast cancer patients during radiotherapy was revealed by another study.[18]

CONCLUSION

The present study suggests that a short term integrated Yoga therapy for just a week can improve the stress and anxiety associated with various psycho-somatic disorders. Yoga helps to keep them calm, relaxed and creates a feeling of wellbeing and optimism in the minds of subjects and hence offers a supporting hand to recover from disease at a faster rate. Therefore, Yoga should be prescribed as a supplement to conventional therapy of a psychosomatic disease.

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Correlation of Blood Insulin Levels with Blood Pressure in Normal Subjects and Patients of Type 2 Diabetes Mellitus (DM)

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ABSTRACT

Background : This study was conducted to see the correlation of blood insulin levels with blood pressure in normal subjects and patients of type 2 Diabetes mellitus (DM).

Method : This was a cross sectional study. All the subjects were investigated for fasting blood insulin and blood pressure. Out of 30 subject studied, 10 were normal while 20 were diabetics.

Result : On studying 20% of normal subjects had hyperinsulinemia, out of which 50% were hypertensive; 30% of diabetics had hyperinsulinemia. Mean value of fasting insulin in normal subjects were 13.8±3.24 μu/ml and 17.3±4.9 μu/ml in diabetics. Odds ratio between hyperinsulinemia and HT were indicating the correlation between two.

Conclusion : Hypertension in more likely to be present in hyperinsulinemic persons.

Keywords : *Hypertension, Hyperinsulinemia, Diabetes mellitus, Insulin, Blood Pressure.*

INTRODUCTION

Hypertension (HT) is a common finding with type 2 diabetes mellitus (DM). Either it coexists, precedes or succeed DM. HT in absence of diabetic nephropathy can be linked to insulin levels. This study was conducted to see the relation between fasting blood insulin levels and blood pressure in normal and diabetic subjects.

Insulin-mediated glucose uptake by muscle varies more than sixfold in apparently healthy individuals[1], with approximately half of the variability in insulin action being genetically determined and the other half resulting from differences in the degree of adiposity and physical fitness[2,3]. Most patients with type 2 diabetes are insulin resistant, and about half of those with essential hypertension are insulin resistant[4]. Therefore, insulin resistance is an important common link between diabetes and hypertension.

A low-grade inflammatory process occurs in both diabetes and hypertension[5]. Even chronic periodontitis is a latent factor in the development of diabetes, hypertension, cardiovascular diseases, and the metabolic syndrome[6-10]. In some ways, diabetes and hypertension could be considered as chronic inflammatory diseases.

There is also a link between mental stress and obesity in patients with diabetes and hypertension. A high prevalence of hypertension in obese subjects has been related to psychosocial factors, including chronic stress[11]. The hypothalamic–pituitary–adrenal axis was suggested as a key mechanism linking obesity, hypertension, and chronic stress[12,13]. Therefore, people should reduce stress to escape from the vicious cycle of mental stress, obesity, diabetes, and hypertension.

Another very important aspect for the onset of diabetes and hypertension is environmental. Environmental factors include the period in utero and lifestyle factors such as diet and physical activity[14]. Gestational diabetes, fetal malnutrition, and high birth

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weight are three factors that may predispose the fetus to cardiometabolic syndrome in adulthood[15,16]. High intake of sodium, alcohol, and unsaturated fat, smoking, lack of physical activity, and mental stress are examples of an unhealthy lifestyle.

AIM & OBJECTIVE

To see the correlation between fasting insulin levels and blood pressure.

MATERIAL & METHODS

The study was conducted in department of Physiology in S. N. Medical College, Agra. A total of 30 diabetic and nondiabetic subjects were enrolled for study. Informed consent from all the subjects were taken. Diabetic patients and their relatives were included. Subjects were recruited from O.P.D. of Medicine. 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 Blood Pressure (to diagnose hypertension)
- B.P. > 130/80 mmHg

or

- Person on antihypertensive medication

For diabetes :

- Fasting Blood glucose level (BGL) ≥ 126 mg/dl.
- Post Prandial BGL ≥ 200 mg/dl

or

- Person on oral hypoglycemics

Criteria to label hyperinsulinemia:

- Blood fasting insulin levels ≥ 20 μu/ml.

OBSERVATION

Table - 1: Age and Sex distribution

	Age Group (Yrs.)	Males	Females	Total
Group A (Nondiabetics/ Normal)	41 – 50	5	4	9
	51 – 60	1	0	1
		6	4	10
Group B (Diabetics)	41 – 50	8	6	14
	51 – 60	3	3	6
		11	9	20
Total		**17**	**13**	**30**

Table - 2: Prevalence of Hypertension

	Normotensive	Hypertensive
Group A	3	7
Group B	3	17
A+B (30)	6	24

RESULT & DISCUSSION

On studying levels of fasting insulin levels both in diabetics and control, 30% of diabetics and 20% nondiabetics persons were hyperinsulinemic. Mean value of insulin in diabetics was 17.30±4.9 while in non diabetics it was 13.8±3.24. On applying student t test (unpaired) p = 0.049, indicating that the correlation of hyperinsulinemia and diabetes is significant.

Table - 3: Correlation of B.P. with insulin levels

	Insulin levels (μu/ml)	B.P. < 130/80 (mmHg)	Hypertensive B.P. > 130/80 (mmHg)
Group A	<20	2	6
	> 20	1	1
Group B	<20	2	12
	> 20	1	5
A+B		6	24

This table shows relation between blood pressure and insulin levels of the subjects. In diabetics 30% of the subjects have fasting hyperinsulinemia and out of these hyperinsulinemic individuals 83.3% were hypertensives.

Regarding control group 20% were hyperinsulinemic and out of 50% were hypertensives and 50% were normotensives.

On applying Odds ratio to see the correlation between hyperinsulinemia, the ratio comes out be 5, indicating that hypertension in more likely to be present in hyperinsulinemic persons.

CONCLUSION

Hypertension in more likely to be present in hyperinsulinemic persons.

Conflict of Interest: None.

Source of Funding: Self.

Ethical Clearance: Taken from college ethical committee.

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Screening of Diabetes Mellitus and its Risk Factors in a Rural Population - A Cross Sectional Study

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ABSTRACT

Background: The disease has been recognized as a global epidemic by WHO. According to the International Diabetes Federation (IDF), the number of people globally with type 2 diabetes mellitus (T2DM) will increase to 552 million by 2030, over twice the number in 2000.Nearly 21% of these new cases will be from India, which has the highest number of cases in any country.

Method: A community-based cross-sectional study was carried out in somthana village that is a field practice area of Indian Institute of Medical Science& Research,Badnapur,Jalna, Maharashtra. As WHO has given theme for WHO day 7th April 2016 as "Beat Diabetes",as a part of WHO day 2016 celebration a Diabetes Screening camp was organized at somthana villagevillage on 7th April 2016. Blood sugar level of all participants in camp above 30 years and who were willing to participate was taken for the study.

Results: Prevalence of IGT and diabetes (combined) was 60% in 61-70 yrs age group followed by 36% in 51-60 years,35% in 41-50 years and 27% in 30-40 years. Prevalence of diabetes is 7.9% in males where as 3.8% in females. Prevalence of IGT is more among Muslims i.e. 31.8% than Hindus i.e. 25.6%. Prevalence of IGT and diabetes is 53.1% and 16.3% respectively in subjects with sedentary life style and difference was statistically significant among sedentary and non-sedentary subjects. There is significant difference in prevalence of IGT and Diabetes among persons with higher BMI (p=0.001).Also there is significant difference in normotensives and hypertensive as prevalence of IGT and diabetes is considered (p=0.039).

Conclusion: The present study found positive association between stress, sedentary lifestyle, family history of diabetes, and hypertension with abnormal glucose tolerance. Primary prevention is possible by modifying the environmental factors influencing diabetogenesis such as obesity, diet and physical activity.

Keywords: *Impaired Glucose Tolerance (IGT), Body Mass Index (BMI), Rural Health Training Centre (RHTC), World Health Organization (WHO).*

INTRODUCTION

According to the International Diabetes Federation (IDF), the number of people globally with type 2 diabetes mellitus (T2DM) will increase to 552 million by 2030, over twice the number in 2000.[1] Nearly 21% of these new cases will be from India, which has the highest number of cases in any country.[1] India currently has 61.3 million diabetics, a figure that is projected to increase to 103 million by 2030.[2] Several studies from different regions of India have shown that prevalence of T2DM is increasing from 8.2% in 1992 to 18.6% in 2008 for urban areas, and from 2.4% in 1992 to 9.2% in 2008 in rural areas.[3-5] Though 72% of Indians reside in rural areas, T2DM incidence and its determinants among rural residents has not been studied to date. The disease has been recognized as a global epidemic by WHO.[6] The largest numbers of diabetic patients are present in our country making India as the diabetes capital of the world.[7] By 2030, India will lead the world at 79.4 million people with diabetes followed by China with 42.3 million and USA with 30.3 million.[8] Though the disease is common both in developed as

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well as developing countries, it remains uncommon in underdeveloped world.[9] Number of diabetic patients is showing discerning upward trend both in urban as well as rural areas. About 2/3rd of population is residing in rural areas and the rural population have different lifestyles, environment and sociocultural factors as they are mostly involved in agrarian and allied work pattern. The diabetic patients of the developing world are in 45-65 yrs of age group in contrast to 64-70 years age group in developed world and the figures are likely to touch 50 mn and 85 mn in developed and developing world respectively.[10] Various studies from developed world [11-13] and urban studies from India have pointed to lifestyle changes[14], sedentary lifestyle, diet and epidemiological transition[15] as major factors in genesis of T2DM. Among the various risk factors, gender and age have been confirmed by many studies[16] besides area of residence and socioeconomic factors like income, literacy, marital status and employment status.[17,18] Among lifestyle risk factors exercise and physical activity are known to be protective while stress has been found to be a specific risk factor for women. Among the physiological risk factors, hypertension, serum triglyceride, high density lipoprotein, cholesterol and body mass index have been incriminated.[19,20] These risk factors may not all be applicable to rural population and it is imperative to identify factors predisposing to the disease in rural areas in particular. Hence the current study was undertaken to determine the risk factors of T2DM among rural population (30 years and above) of Maharashtra.

MATERIALS AND METHOD

A community-based cross-sectional study was carried out in somthan village which is a field practice area of Indian Institute of Medical Science& Research Medical College, Badnapur,Jalna, Maharashtra during the month of April 2016. As World Health Organization (WHO) has given theme for WHO day 7th April 2016 as "Beat Diabetes",as a part of WHO day 2016 celebration a Diabetes Screening camp was organized at somthana village on 7th April 2016. A total of 180 subjects were interviewed in the camp, out of that 142 subjects who fulfilling the inclusion criteria (age above 30 years and who were willing to participate) were enrolled for the study.Known diabetics and patients taking any sort of medicines for diabetics were excluded from the study.

Hence the total numbers of 142 subjectswere screened. In all subjects, family history of diabetes was obtained and details on physical activities and other parameters were assessed. Waist measurements were obtained using a standardized technique. Socio-economic status was assessed according to modified BG Prasad classification based on CPI of April 2016,[19]and Asia pacific guidelines[20] was considered to classify BMI as underweight (<18.5), normal (18.5 to 23.0), overweight (23.1-27.5) and obese (>27.5). Study participants who were fasting at the time of interview were asked to take food and come after 2 hours and their blood sample were taken after 2 hours of food intake as post prandial blood sugar level.WHO criteria was considered to classify 2 hours glucose levels as normal (<140mg/dl), impaired glucose tolerance (140-200mg/dl) and diabetes (>200mg/dl).

Data analysis: Data was entered in Microsoft Excel and analyzed by using SPSS version 20.0

RESULTS

Table1: Association of study subjects according to Non-modifiable risk factors of diabetes

		BSL Category								
		NGT		IGT		Diabetic		Total		P-value
		No.	%	No.	%	No.	%	No.	%	
Age Group	30-40yrs	38	73.1	11	21.2	03	5.8	52	100.0	0.351
	41-50yrs	26	65.0	13	32.5	01	2.5	40	100.0	
	51-60yrs	16	64.0	07	28.0	02	8.0	25	100.0	
	61-70yrs	08	40.0	10	50.0	02	10.6	20	100.0	
	>70yrs	04	80.0	01	20.0	00	0.0	05	100.0	
	Total	**92**		**42**		**08**		**142**	**100.0**	

***Cont...*Table1: Association of study subjects according to Non-modifiable risk factors of diabetes**

Sex	Male	39	61.9	19	30.2	05	7.9	63	100.0	0.542
	Female	53	67.1	23	29.1	03	3.8	79	100.0	
	Total	92		42		08		142	100.0	
Religion	Hindu	24	61.5	10	25.6	05	12.8	39	100.0	0.213
	Muslim	57	64.8	28	31.8	03	3.4	88	100.0	
	Other	11	73.3	04	26.7	00	0.0	15	100.0	
	Total	92		42		08		142	100.0	
Family history of diabetes	YES	13	27.1	28	58.3	7	14.6	48	100.0	0.001*
	NO	79	84.0	14	14.9	01	1.1	94	100.0	
	Total	**92**	**64.8**	**42**	**29.6**	**08**	**5.6**	**142**	**100.0**	

BSL- Blood Sugar level NGT- Normal Glucose Tolerance IGT- Impaired Glucose Tolerance

As far as non-modifiable risk factors of diabetes is concerned, our study shows that in age group of 61 to 70 years prevalence of IGT and diabetes (combined) is 60% followed by 36% in 51-60 years,35% in 41-50 years and 27 % in 30-40 years. Prevalence of diabetes is 7.9% in males where as in females it is 3.8 percent but there is almost equal prevalence of IGT among males and females. Prevalence of IGT is more among Muslims (31.8%) than Hindus (25.6%). But there is no significant difference in groups when age sex and religion was considered.Prevalence of IGT and diabetes is 58.3% and 14.6% respectively in subjects with positive family history of diabetes and difference was statically significant. (P=0.001)----

Table 2: Association of study subjects according to modifiable risk factors of diabetes

		BSL Category								
		NGT		**IGT**		**Diabetic**		**Total**		**P-value**
		No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	
SES	**Lower middle**	17	65.4	07	26.9	02	7.7	26	100.0	0.843
	Upper lower	46	61.3	25	33.3	04	5.3	75	100.0	
	Lower	29	70.7	10	24.4	02	4.9	41	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	
Occupation	**Housewife**	42	61.8	21	30.9	05	7.4	68	100.0	0.814
	Unemployed	20	64.5	09	29.0	02	6.5	31	100.0	
	Labourer	30	69.8	12	27.9	01	2.3	43	100.0	
	Professional	00	0.0	00	0.0	00	0.0	0	0.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	
Education	Illiterate	47	64.4	21	28.8	05	6.8	73	100.0	0.913
	Primary	17	70.8	06	25.0	01	4.2	24	100.0	
	Middle	28	62.2	15	33.3	02	4.4	45	100.0	
	Highschool	00	0.0	00	0.0	00	0.0	00	0.0	
	HSC	00	0.0	00	0.0	00	0.0	00	0.0	
	Graduate and above	00	0.0	00	0.0	00	0.0	00	0.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	
Lifestyle	**Sedentary**	15	30.6	26	53.1	08	16.3	49	100.0	0.001*
	Non sedentary	77	82.8	16	17.2	00	0.0	93	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	

BSL- Blood Sugar level NGT- Normal Glucose Tolerance IGT-Impaired Glucose Tolerance

As far as modifiable risk factors are considered (As shown in Table2), our study shows that prevalence of IGT and diabetes (combined) is 38.6 % in upper lower class of socioeconomic status which is slightly more than other socioeconomic classes but it was not significant. Occupation and educational status both doesn't show any significant difference in different groups.Prevalence of IGT and diabetes is 53.1% and 16.3% respectively in subjects with sedentary life style and difference was statistically significant among sedentary and non-sedentary subjects.

Table 3: Association of study subjects according to BMI and Blood pressure

		BSL Category								
		NGT		IGT		Diabetic		Total		P –value
		No.	%	No.	%	No.	%	No.	%	
BMI Asian Criteria	**Underweight**	12	85.7	02	14.3	00	0.0	14	100.0	0.001*
	Normal	59	77.6	16	21.1	01	1.3	76	100.0	
	Pre-obese	18	56.2	14	43.8	00	0.0	32	100.0	
	Obese	03	15.0	10	50.0	07	35.0	20	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	
SBP	**Normotensive**	51	64.6	25	31.6	03	3.8	79	100.0	0.516
	Hypertensive	41	65.1	17	27.0	05	7.9	63	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	
DBP	**Normotensive**	81	61.8	42	32.1	08	6.1	131	100.0	0.039*
	Hypertensive	11	100.0	00	0.0	00	0.0	11	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	

BSL- Blood Sugar level NGT- Normal Glucose Tolerance IGT-Impaired Glucose Tolerance

Table 3 shows that, in our study among 20 obese subjects 50 % shows impaired glucose tolerance and 35 % shows diabetes and there is significant difference in prevalence of IGT and Diabetes among persons with higher BMI (p=0.001).Also there is significant difference in normotensives and hypertensive as prevalence of IGT and diabetes is considered (p=0.039).

DISCUSSION

Abnormal glucose tolerance in relation to blood pressure:

In the present study, prevalence of diabetes and IGT in hypertensive population was 7.9% and 27% respectively. We observed that there was significant association between blood pressure and abnormal glucose tolerance (p<0.001). Similar observation was also made by HamitAcemoglu et al[21] that Type 2 DM was more frequent among people with hypertension than with norma-tension and also was significantly associated (11.5% vs. 3.38%, p=0.0001). According to regression analysis, DM was 2 times higher in hypertensive than in normotensives.

Abnormal glucose tolerance in relation to family history:

Amongst 8 diabetics, 7 had family history of diabetes and 50% of persons with IGT had family history of diabetes. Family history of diabetes was significantly associated with abnormal glucose tolerance (p<0.001). In a similar study done by Kokiwaret al[22]also revealed that high prevalence was in individuals having family history of diabetes (46.93%) as compared to those with those with no such history (11.31%) (p<0.001)

Abnormal Glucose Tolerance and Physical Activity:

Prevalence of IGT and diabetes is 53.1% and 16.3% respectively in subjects with sedentary life style and difference was statistically significant among sedentary and non-sedentary subjects (p<0.001). Similarly observations were seen by Kokiwaret al[22] study, it was found that prevalence of diabetes was significantly

greater amongst people doing sedentary physical activity (33.84%) as compared to people involved in heavy physical activity (11.53%). The protective effect of physical activity against diabetes mellitus is possibly due to increased insulin sensitivity which can be accentuated by weight loss achieved through physical activity.

Abnormal Glucose Intolerance and BMI:

In our study, among 20 obese subjects 50% shows impaired glucose tolerance and 35% shows diabetes.There is significant difference in prevalence of IGT and Diabetes among persons with higher BMI ($p=0.001$).BMI was significantly associated with abnormal glucose tolerance ($p<0.001$). Similarly in a study done by Kokiwar et al[22], it was observed that abnormal glucose tolerance was significantly higher in those with BMI ≥ 25kg/m2 (27.47%) as compared to those having BMI <25kg/m2 (9.7%) ($p<0.001$). Another study by Dhadwal D et al[23] also found obesity was significantly associated with diabetes ($p<0.05$). Prevalence of diabetes was 4.15% in <25 BMI subjects and it was 6.7% in the individuals with BMI >25. ($p<0.05$). Obesity causes stress in endoplasmic reticulum, this stress results in suppression of signals of insulin receptors leading to insulin resistance.

CONCLUSION

The present study found positive association between stress, sedentary lifestyle, family history of diabetes, and hypertension and alcohol consumption with abnormal glucose tolerance. It was also found that type of family and type of diet were not significantly associated with abnormal glucose tolerance. Primary prevention is possible by modifying the environmental factors influencing diabetogenesis such as obesity, diet and physical activity. Long term studies have shown that beneficial effects of life style.

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Ethical approval: The study was approved by the institutional ethics committee

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Evaluation of Cardiovascular Risk in Young Adults

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ABSTRACT

Background: Overweight and obesity are becoming more common in the youth of India because of physical inactivity and improved standard of living. Overweight, improper dietary habits and stress are considered as the modifiable risk factors for developing cardiovascular diseases. Cardiovascular risk factors in young adults can be easily evaluated by performing simple non invasive tests such as evaluation of rate pressure product (RPP) which indirectly determines the myocardial oxygen consumption and cardiac parasympathetic function tests.

Aims and objectives: To assess the cardiovascular risk factors in underweight and overweight young adults.

Materials and method: 180 healthy participants were grouped based on their BMI values as underweight (60), normal weight (60) and overweight (60). BP and heart rate were recorded and RPP was calculated. Cardiac parasympathetic tests such as 30:15Ratio and Valsalva Ratio were measured. Comparison between the groups was done by one way ANOVA and correlation between various parameters was done using Pearson's correlation co-efficient.

Results: BP and RPP was significantly higher and cardiac parasympathetic tests were significantly reduced in overweight compared to normal weight. We found significant positive correlation between BMI and BP and Rate pressure product, negative correlation between BMI and Valsalva ratio.

Conclusion: Increased BMI is associated with increased BP, reduced cardiac parasympathetic activity and increased myocardial oxygen consumption which leads to increase workload on the heart. We should emphasise on increasing awareness about overweight in young adults, bringing in preventive measures to reduce the cardiovascular risk factors and future complications.

***Keywords**: Blood pressure, Body mass index, Cardiovascular risk, Parasympathetic tests, Rate pressure product, Overweight*

INTRODUCTION

Cardiovascular diseases are on the rise, affecting not only the aged, but the younger population too. In developing India, despite issues of under-nutrition and underweight, the youth of India are becoming more prone to overweight and obesity, due to improved standard of living and physical inactivity. This co existing state of underweight and overweight pose a double burden to our society.[1]

Overweight, improper dietary habits and stress are considered as the modifiable risk factors for developing cardiovascular diseases.[2] Obesity harms the cardiovascular system and being overweight from younger age would make the person more susceptible to heart diseases in the later years.[3] Overweight and obesity are associated with increased incidence of hypertension, congestive cardiac failure, unexplained sudden death [4] and also is a risk factor for developing diabetes mellitus.[5]

Cardiovascular risk factors in young adults can be

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easily evaluated by performing simple non invasive tests such as evaluation of rate pressure product (RPP) and cardiac parasympathetic function tests. RPP is the product of the heart rate and systolic blood pressure which indirectly determines the myocardial oxygen consumption(MVO_2). MVO_2 is the most important indicator of the efficiency of the myocardium to perform work or in other words the load on the heart. [6] Hence RPP indirectly can be a very useful in evaluating the cardiovascular risks. [7] With this background, we evaluate the cardiovascular risk factors in young adults based on their body mass index (BMI).

MATERIALS AND METHOD

The study was conducted in Department of Physiology. 180 participants (males and females) of the age group 18-25years were included for the study after obtaining approval from the Institutional Ethical Committee and informed consent were taken from the participants for the study.. The participants were the healthy attendants of patients who visited the college hospital. Subjects with history of Diabetes mellitus, Hypertension, other cardiovascular diseases were excluded from the study. Height and weight was measured and Body mass index (BMI) was calculated by Quetelet's index, BMI = Weight (kg)/Height $(m)^2$. Participants were categorised into three groups based on the BMI values as follows: Underweight (BMI $\leq$18.5 kg /m^2), Normal weight (BMI 18.5 – 24.9 kg /m^2) Overweight (BMI 25-29.9 kg/m^2).

Blood pressure was recorded using sphygmomanometer after 10 minutes of rest in supine position. Continuous electrocardiogram (ECG) was recorded for 5minutes to obtain resting heart rate using computerized ECG. Rate pressure product (RPP) was calculated as the product of Systolic BP and Heart rate (SBP x HR) x 10^{-2}

Following cardiac parasympathetic tests were performed.

1. Heart rate response to postural change (30:15 ratio)

2. Heart rate response to Valsalva manoeuvre (Valsalva Ratio)

Heart rate response to postural change (30:15 ratio): After 5minutes of continuous ECG recording in the supine position, participants were asked to stand up unaided as quickly as possible (within 3sec) for at least 30seconds. During this continuous ECG was recorded. 30:15 ratio was calculated by taking the ratio of longest RR interval around the 30^{th} beat after standing to the shortest RR interval around the 15^{th} beat after standing.

Heart rate response to Valsalva manoeuvre: Each participant was instructed to exhale forcefully through the mouth piece of a modified mercury manometer and to maintain pressure in the manometer up to 40 mmHg for 15 seconds. ECG was recorded during the manoeuvre and continued for about 30 seconds after the performance. Valsalva Ratio was calculated by taking the ratio of the longest RR interval after blowing to the shortest RR interval during the manoeuvre

Statistical analysis:

Descriptive data are presented as mean $\pm$ standard deviation. Comparison between the groups was done by one way ANOVA. Correlation between BMI and Blood pressure values, rate pressure products and cardiac parasympathetic tests was done using Pearson's coefficient. Results were considered to be significant taking 5% as the level of significance. The data was analysed by using SPSS version 17.

RESULTS

Out of 180 participants, 60 were underweight, 60 normal weight and 60 overweight. The mean age of participants was 22.65$\pm$ 1.6 years

Systolic blood pressure, diastolic blood pressure and mean resting rate pressure product (RPP) were significantly higher in overweight when compared to normal weight subjects (Table1&2).

In overweight, we also found that the cardiac parasympathetic tests- 30:15ratio and Valsalva ratio were significantly lower than normal weight subjects (Table1&2)

We did not find any significant difference in blood pressure values, heart rate, rate pressure product and cardiac parasympathetic function tests between underweight and normal weight subjects (Table1&2)

Table 1: **Anthropometric values, Blood pressure, Rate pressure product and cardiac parasympathetic function tests in underweight, normal weight and overweight young adults**

Parameters	Normal weight (60)	Underweight (60)	Overweight (60)
Weight (Kg)	54.7+5.9	45.4+ 4.9	71.6+ 10.1
Height (m)	1.61+0.84	1.60+0.76	1.61+0.89
BMI (Kg/m^2)	20.98+1.8	17.63+0.89	27.22+0.18
Heart rate (per minute)	71.86+8.6	74.13+ 8.6	71.6+ 6.64
Systolic BP (mmHg)	115.4+12.22	110.4+ 12.6	134.4+ 13.9
Diastolic BP (mmHg)	72.3+8.11	69.16+ 8.6	84.4+ 7.75
RPP	83.1+14.3	81.87+ 13.2	96.14+ 12.1
30:15 Ratio	1.18+0.15	1.15+ 0.11	1.10+ 0.12
Valsalva Ratio	1.56+0.3	1.63+ 0.4	1.30+ 0.25

Kg= Kilogram, m= metres, BP= Blood pressure, mmHg= millimetres of mercury, RPP= rate pressure product

Table 2: Comparison of various parameters of underweight and overweight subjects with normal weight subjects

Parameters	Underweight and Normal weight (p value)	Overweight and normal weight (p value)
Weight	0.000	0.000
Height	0.405	0.876
BMI	0.000	0.000
Heart rate	0.155	0.851
Systolic BP	0.029	0.000
Diastolic BP	0.043	0.000
RPP	0.635	0.000
30:15 Ratio	0.264	0.004
Valsalva ratio	0.359	0.000

P value < 0.05 is significant

We found significant positive correlation between BMI and systolic BP, diastolic BP and Rate pressure product, negative correlation between BMI and 30:15 ratio (insignificant) and Valsalva ratio (significant). There was significant negative correlation between Systolic BP and 30:15ratio and valsalva ratio which means as Systolic BP increased there was reduction in cardiac parasympathetic function. (Table 3)

Rate pressure product is positively and significantly correlated with BMI, heart rate, Systolic BP and diastolic BP indicating that as BMI increased there is increase in the blood pressure and increase in MVO_2. (Table 3)

Table 3: Correlation between all the variables

		BMI	Heart rate	Systolic BP	Diastolic BP	Rate pressure product	30:15 Ratio	Valsalva Ratio
BMI	Pearson Correlation	1	-.092	.608**	.603**	.430**	-.146	-.351**
	Sig. (2-tailed)		.221	.000	.000	.000	.051	.000
Heart rate	Pearson Correlation	-.092	1	-.077	-.045	.588**	.067	.092
	Sig. (2-tailed)	.221		.307	.551	.000	.371	.221
Systolic BP	Pearson Correlation	.608**	-.077	1	.666**	.758**	-.179*	-.210**
	Sig. (2-tailed)	.000	.307		.000	.000	.016	.005
Diastolic BP	Pearson Correlation	.603**	-.045	.666**	1	.503**	-.117	-.154*
	Sig. (2-tailed)	.000	.551	.000		.000	.119	.040
Rate pressure product	Pearson Correlation	.430**	.588**	.758**	.503**	1	-.092	-.113
	Sig. (2-tailed)	.000	.000	.000	.000		.218	.132
30:15 ratio	Pearson Correlation	-.146	.067	-.179*	-.117	-.092	1	.137
	Sig. (2-tailed)	.051	.371	.016	.119	.218		.067
Valsalva ratio	Pearson Correlation	-.351**	.092	-.210**	-.154*	-.113	.137	1
	Sig. (2-tailed)	.000	.221	.005	.040	.132	.067	

** Significant correlation

DISCUSSION

In our study, we found significantly higher blood pressure values, both systolic and diastolic, in the overweight subjects compared to normal weight. Similar results were reported by other studies [8,9,10] Increased BMI and high normal blood pressure are both risk factors for developing cardiovascular diseases in otherwise normal individuals

Mean RPP was significantly greater in overweight. RPP indirectly determines myocardial oxygen consumption indicating that overweight individuals consume more oxygen than normal weight. Higher RPP is due to increase in Systolic BP indicating that there is increase in the myocardial activity in the overweight. [7] According to Sembuligam et al, [11] the safest RPP should be between70-90 under resting conditions. In our study, overweight participants had RPP greater than the safest values and are hence at high risk of developing cardiovascular complications.

We also observed a significant reduction in the cardiac parasympathetic function in overweight, similar to previous studies. [4,12,13] Thayer JF et al[14] gives evidence that decreased parasympathetic activity precedes the development of various risk factors and this is further associated with increased incidence of morbidity and mortality.

Among the underweight subjects, the systolic and diastolic blood pressure and RPP were lower than the normal weight group but not statistically significant. We did not find any significant alteration in the parasympathetic activity in this group, comparable to WU JS et al. [15]

When we correlated all the variables taking all study participants as one group, we found a significant positive correlation between BMI, Systolic BP, Diastolic BP and Rate pressure product. This was in concordance with findings of previous studies. [16,17]

However, we found a negative and significant correlation between BMI, 30:15 Ratio and Valsalva ratio. As BMI increased there is an increase in RPP, which may be due to reduced parasympathetic activity[18] and increased sympathetic tone. This in turn can lead to cardiovascular complications. Hence, RPP is proven to

be altered by autonomic modulation which is seen to occur in overweight and obese individuals. Figueroa Et al [6] proved that a lesser RPP indicates an increased activity of parasympathetic system which in turn is cardio-protective.

Since the heart rate was not significantly elevated in overweight participants, the rise in RPP is mainly due to the increase in systolic blood pressure. Hence, modification of associated autonomic mechanisms like attenuation of sympathetic tone, can be attempted in these individuals to reduce the peripheral resistance so that blood pressure may be reduced.

We conclude that, increased BMI is associated with increased blood pressure, reduced cardiac parasympathetic activity and increased oxygen consumption, all of which leads to increased workload on the heart thus making the person prone for cardiovascular diseases. We should emphasize on creating awareness about overweight and obesity in adolescents and young adults, bringing in preventive measures to reduce the risk factors among this specific population, so that they are less vulnerable to develop morbidities in future.

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Comparison of Handgrip Strength among Cricketers and Collegiate

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ABSTRACT

Background: Grip strength is an indicator of overall physical strength. It is a functional index of endurance and forearm strength. The purpose of the study is to assess and compare handgrip strength among cricketers and the control group. The present study has been put forward to study the functional integrity of upper extremity and excellent performance in cricket.

Method: Study group consists of district and state level male cricketers in the age group of 17-25 from K.R. cricket academy, Chennai. The control group consists of age and sex matched college students from omandurar government medical college. Handgrip strength assessed using Handgrip Dynamometer.

Statistical analysis: Independent t test was done to compare between two groups. Statistical analysis was done using SPSS version 20.

Result: The handgrip strength of cricketers is highly significant than that of control group and the right handgrip strength is higher than left hand grip strength in both the groups**.**

Conclusion: Thus handgrip strength can be used as a selective criterion for better performance in cricket and also as an indicator of overall body strength.

Keywords*: Handgrip strength, Handgrip Dynamometer, Cricketers.*

INTRODUCTION

Handgrip strength refers to the muscular strength and force generated from the hands. It is the result of forceful flexion of all finger joints and wrist with maximum voluntary force exerted by the subject under normal biokinetic condition .Handgrip strength is a physiological variable that has strong correlation with anthropometric variables like height, weight and BMI[1].It also varies with age and gender, as men showed maximal handgrip force in both hands than women[2]

Handgrip strength is a functional index of nutritional status, lean body mass and physical activity[3].In right handed people, Handgrip strength was reported to be higher in dominant hand than nondominant .Dominant hand plays important role in daily muscular activities and sports. Cricket requires greater upper extremity power i.e., .shoulder power especially for batting, throwing ball during fielding and bowling[4]. Hand grip strength is a significant predictor of performance in various sports activities .So the present study was planned.

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MATERIALS AND METHOD

STUDY GROUP: 40 District and state level male cricketers from kilpauk K.R. cricket academy, Chennai.

CONTROL GROUP: 40 Age and gender matched (except playing condition) collegiate students from omandurar government medical college ,Chennai.

STUDY DESIGN: Cross-sectional study with

sample size of 80 taken by convenience sampling and the study duration was 3 months from march-may 2017.

INCLUSION CRITERIA:

1. Cricket players undergoing minimum 3 years training.

2 .Male cricketers of 17-25 years age group.

EXCLUSION CRITERIA:

1. Players with recent neuro muscular and bony injury.

2. Any cardiovascular or respiratory disorder affecting musculo skeletal function.

Ethical committee approval was obtained. After explaining the procedure, informed consent was obtained from the subjects. Anthropometric measurement like height was measured using staturemeter (Bio-plus, Bharat enterprises, Delhi) with the subject upright in inspiration, to the nearest 0.1cm.Weight measured using weighing scale (KRUPS Dr.Bellman enterprises, NewDelhi) to the nearest 0.1kg. The BMI was then calculated using the formula weight (kg)/height (m^2).

TECHNIQUE

Preliminary clinical examination of subjects was carried out to exclude any neurological or musculoskeletal impairment in upper limbs or systemic cardiovascular / respiratory disorder affecting musculoskeletal functioning.

The grip strength of both right and left hands was measured using a standard adjustable automatic hand grip dynamometer (Jupiter scientific company, Salem India) at standing position with shoulder adducted and neutrally rotated and elbow in full extension. The subjects were asked to put maximum force on the dynamometer thrice with 30 seconds recovery, from both sides of the hand and the best of the three trials was taken as grip strength All anthropometric equipments and hand grip dynamometer were calibrated before the assessment.

DATA ANALYSIS

Descriptive statistics (mean ± standard deviation) were determined for all measured and derived variables. Comparisons between cricketers and controls for all the measured variables were made using an independent t-test. Pearson's correlation coefficients were used to find correlation of right and left handgrip strength with the variables measured... Data were analyzed using SPSS (Statistical Package for Social Science) version 20. Probability with $p<0.05$ was used to indicate statistical significance.

RESULTS

The mean value of height for the study group was 170.68±6.45and for the control group 169.45±6.9.cricketers with mean weight 63.08±8.1 and control group with 61.73±14.4.Cricketers with mean BMI 21.78±2.4 and control with 21.4±4.2.The mean values of descriptive variables for both the groups given in Table-1.

Right arm grip strength of cricketers showed mean of 47.65±1.9 and the control group mean value was 43.25±4.6 with $p<0.001$.The mean value of Left arm grip strength of cricketers was 47.13±2.4 and for the control group41.58±5.2 with $p<0.001$.The right and left arm strength of cricketers were highly significant than that of collegiate students. (Table-1)

TABLE 1: DESCRIPTIVE STATISTICS AND HANDGRIP STENGTH FOR CRICKETERS AND CONTROL S.

	Group(n=40)	Mean	Std. Deviation	t- test	P value
Height	cricketers	170.68	6.458	0.818	0.416
	control	169.45	6.921		
Weight	cricketers	63.08	8.163	0.516	0.608
	control	61.73	14.408		
BMI	cricketers	21.78	2.496	0.483	0.630
	control	21.40	4.229		
RIGHT ARM	cricketers	47.65	1.955	5.550	0.001**
	control	43.25	4.617		
LEFT ARM	cricketers	47.13	2.462	6.019	0.001**
	control	41.58	5.286		

**P<0.001 HIGHLY SIGNIFICANT

By Pearson correlation test, positive correlation was obtained for handgrip strength with height, weight and BMI in cricketers with r values showing linear regression... In cricketers, right hand grip strength had positive correlations with height(r = 0.245), weight (r = 0.289) and BMI (r = 0.302) as given in Table-2.

TABLE: 2 CORRELATION CO-EFFICIENT OF HANDGRIP STRENGTH IN CRICKETERS AND CONTROLS.

Variable	Cricketers(r value) n=40		Control(r value) n=40	
	Right	Left	Right	Left
HEIGHT	0.245	0.301	0.340	0.472
WEIGHT	0.289	0.281	0.374	0.346
BMI	0.302	0.130	0.282	0.197
RIGHTGRIP STRENGTH	1.000	0.585**	1.000	0.692**
LEFTGRIP SRENGTH	0.585**	1.000	0.692**	1.000

**P<0.01 SIGNIFICANT

DISCUSSION

Grip strength has long been thought of as a possible predictor of overall body strength. Many daily functions and sporting events require high activity levels of the flexor musculature of the forearms and hands. These are the muscles involved in gripping strength. Cricket is a game of endurance and body strength. The strength of one's own grip plays a key role in injury prevention and strength development .In our study the mean handgrip strength of cricketers was higher than that of control group which indicates the effect of regular physical training by the players.

The findings of the present study also indicate that on comparison of grip strength between dominant hand and non-dominant hand, it was found that dominant hand had higher values of grip strength mean range than the non-dominant hand[5]. This supports the findings of 10% rule. The 10% rule states that the dominant hand possesses greater grip strength than the non-dominant hand[6].It was observed that hand grip strength correlated with throwing speed in experienced pitchers in a previous study[7].

The Harvard study suggests that simply measuring one's hand grip strength could be a good way to assess biological age and grip strength might act as a biomarker of ageing across the life course. Handedness inherits genetically, but handgrip strength is affected greatly by nutritional status of an individual. That's why hand grip strength has been considered as a functional index of nutritional status[8].

Women scored about 50% lower than men for upper body strength and about 30% less for leg strength[9]. The present study does not include female subjects and studies in future to compare the two groups can be carried out.

The hand grip strength increases with age in both male and female children[10]. This age related increase is associated with changes in muscle mass during growth. In male subjects, there was significant positive correlation of hand grip with height, weight and BMI[11].

In the present study, cricketers with higher mean values of height, weight and BMI have recorded higher mean handgrip strength for both the hands with positive correlation as given in Table-2. The statistical significance value p>0.05 for r value of anthropometric variables may be due to sample size.

The Resistance as well as the Free Weight Exercises were equally effective for improving the hand grip strength in cricket players[12]. Right-hand grip strength was greater than left-hand grip strength in both males and females, and right-hand grip strength was greater than left-hand grip strength regardless of gender or handedness as studied by Ergonomics study of grip strength by Dennis B. Brickman. In our study also right handgrip strength of both the groups was higher than the left .And all the subjects were right handed. The non-dominant handgrip strength of cricketers was also found

to be higher than control group.

This has proved that the regular training and continuous physical activity of cricketers has improved strength of both upper extremities .This helps the cricket players for throwing ball with high speed and to occupy deep position in fielding. This also helps in selection of order of Batsman for better performance without fatigue in one day matches.

CONCLUSION

Our study has concluded that grip strength of cricketers for both the hands were higher than the control group which is very essential for better performance in their game. The collegiate students can also improve their overall body strength, which in turn improves their grip strength by undergoing regular resistive exercise training.

Conflict of Interest: None declared.

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Effect of Body Mass Index and Age on Thyroid Function

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ABSTRACT

Background and Objectives: Obesity has become an important public health concern as it is associated with an increased risk of diabetes, dyslipidemia, kidney disease, cardiovascular disease, and even cancer. Moreover, obesity is linked to many endocrine abnormalities, including thyroid dysfunction. Many studies on euthyroid individuals have shown a significant association between body mass index (BMI) and thyroid function. Identifying the complex inter-relationship between thyroid function and obesity may help in prevention and treatment of obesity and thyroid dysfunction, as both are very common dilemma. The present study aimed at understanding the effect of BMI and age on thyroid function in apparently healthy euthyroid individuals.

Materials and Method: 84 apparently healthy euthyroid subjects of 18-60 years of age were included in the study. The subjects were classified according to their age & BMI and their thyroid hormone profile was estimated by Lumax chemiluminescence immunoassay (Acculite CLIA microwells kit) strip reader. Students't test and one way ANOVA with Tukey HSD post hoc test were used for data analysis. $p < 0.05$ was considered significant.

Results: BMI was significantly higher in older adulthood group as compared to young and middle adulthood groups. S. TSH was higher, while S. T3 and S. T4 were found to be lower in obese subjects. With increasing grades of BMI from normal to over-weight to obese, S. TSH values increased whereas S. T3 and S. T4 values were found to be decreased. The thyroid hormone profile does not shows any significance difference in different age group of normal and obese subjects

Conclusion: Obesity is associated with decreased thyroid gland function while age does not significantly affect the thyroid function.

Keywords: *Body Mass Index, Obesity, Hyperthyroidism, Hypothyroidism, Thyroid Hormones.*

INTRODUCTION

Obesity is an epidemic across the world. The prevalence of obesity has increased worldwide since the mid-1970s.[1] Currently efforts to understand this multi-faceted problem are of top priority in public health.

Many factors have been found to affect a person's weight, including lifestyle choices like nutritional behaviour and physical activity, as well as genetic, environmental and endocrinal factors. Obesity is associated with an increased risk of diabetes, dyslipidemia, kidney disease, cardiovascular disease, and even cancer.[1] Thus, severe obesity is an important cause of premature mortality, especially in middle-aged adults.[2] Moreover, obesity, especially central obesity, is linked to many endocrine abnormalities,[3] including thyroid dysfunction.[4] This is not surprising because thyroid hormone regulates energy metabolism and thermogenesis, and plays a critical role in glucose metabolism and lipid metabolism, food intake, and oxidation of fatty acids.[4]

Recently, several clinical studies evaluated the issue of hormonal changes associated with obesity, especially thyroid hormones and their association with obesity has been well documented in individuals with

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thyroid disorders. Overt hypothyroidism is known to be related to weight gain, while overt hyperthyroidism leads to weight loss. An elevated serum concentration of Thyroid Stimulating Hormone (TSH, Thyrotropin), suggesting subclinical hypothyroidism, was frequently reported in human obesity. Several investigations, mostly represented by cross-sectional population studies, suggested that thyroid function (even within the normal range) could be one of several factors contributing to determining body weight in the general population.[5] However, most studies that have been done on euthyroid individuals have shown that there is a significant association between Body Mass Index (BMI) and thyroid function.

From a clinical point of view, obesity and mild thyroid failure are common diseases. More studies are needed to fully understand the extent of the association and translate the findings into practical use in the clinical setting. The present study aimed at understanding the association between thyroid function and obesity in apparently healthy euthyroid individuals. Understanding the role of thyroid hormones and obesity is not a new focus; however, looking at the impact of thyroid hormone level within physiological range in normal and obese population is a relatively new approach. Identifying the complex inter-relationship between thyroid function and obesity may help in prevention and treatment of obesity and thyroid dysfunction, as both are very common dilemma.

MATERIALS AND METHOD

This cross-sectional study was carried out in department of Physiology, Smt. NHL Municipal Medical College & V.S. General Hospital, Ahmedabad, Gujarat, India as dissertation for MD Physiology degree after obtaining ethical approval from Institutional Ethics Committee.

After obtaining a written informed consent, detailed history taking and physical examination was done. Apparently healthy euthyroid (thyroid hormone profile within reference range of laboratory) subjects of 18-60 years of age were included in the study; whereas subjects having thyroid disease or any other non-thyroid illness, subjects taking medications which may affect thyroid functions like Glucocorticoids, β-blocker, Oral contraceptive pills etc., pregnant and nursing women, smokers and/or alcoholics, subjects with BMI <18.5 were excluded.

Age groups were classified based on International Age Classification by United Nations.[6] Body weight was measured to the nearest 1.0 kg using mechanical weighing machine (Gebruder Soehnle, West Germany) with subjects wearing minimal clothing and without shoes. Height was measured to the nearest 1.0 cm freestanding without shoes using measure tape (Crown, India). BMI was calculated as Body weight (kg) / Height (meter).[2] As per WHO guidelines (2003) for Asian population for defining obesity, the cut of value of BMI is 23, which was used in study,[7] and subjects were divided in two groups: Group I = Normal (BMI: 18.5 to 22.99), Group II = Obese (BMI: ≥ 23) [including both over-weight and obese]. For Thyroid hormone profile, 5 ml venous blood was collected in plain vacutainer by aseptic precautions after 8-12 hours of fasting. The sample was allowed to clot and was transported in 20 - 25˚C icepack at laboratory. All samples were centrifuged at 2000 rpm for 5 min and supernatant serum was collected. Thyroid hormone levels (S. TSH, Total S. T3, and Total S. T4) were estimated by Lumax chemiluminescence immunoassay (Acculite CLIA microwells kit) strip reader. [Principle: S. TSH: Streptavidin Biotin Based Sandwich Assay, with 0.03 mIU/l sensitivity. Total S. T3: Competitive Immunoassay, with 4 ng/dl sensitivity. Total S. T4: Competitive Immunoassay, with 0.1 µg/dl sensitivity.]

Microsoft® Office Excel® 2007 (© 2006 Microsoft Corporation, USA) and SPSS Statistics 20.0 (IBM® SPSS® system, IBM Corp. New York) were used for data analysis. The significance of differences within groups and across the groups was evaluated by student t test, one way analysis of variance (ANOVA) with Tukey HSD post hoc test. $p < 0.05$ was considered significant.

RESULTS

Initially, 100 subjects were selected for the study by history and clinical examination. 14 subjects were excluded because their thyroid hormone profile was not in laboratory reference range. So, finally 84 subjects were included in the present study and data analysis was done.

Table 1 shows BMI values in different gender and age groups. There was no statistical difference in BMI values between males and females, but BMI was significantly higher in older adulthood group as

compared to young and middle adulthood groups.

Table 2 shows Thyroid hormone profile in Normal and Obese study groups. S. TSH was higher, while S. T3 and S. T4 were found to be lower in obese subjects.

Table 3 shows Thyroid hormone profile in different grades of BMI. With increasing grades of BMI from normal to over-weight to obese, S. TSH values increased whereas S. T3 and S. T4 values were found to be decreased. The data was statistically significant.

Table 4 and Table 5 show Thyroid hormone profile in different age groups in normal and obese subjects respectively. The thyroid hormone profile does not show any significance difference in different age groups of normal and obese subjects.

DISCUSSION

In this cross-sectional study, we analyzed data of 84 euthyroid participants to look for possible inter-relationship between thyroid function, obesity and different age groups. Extensive research material is available when issues about weight and thyroid dysfunction are concerned; however, it is limited when looking at euthyroid individuals. It has been well documented that both hypothyroidism and hyperthyroidism affect weight in humans.

The BMI was found to be significantly higher in older adulthood (Table 1). In case of gender, the BMI difference was insignificant**.** Our findings concur with studies that reported increase in BMI with age.[8, 9, 10] This finding suggests that age plays an important role in development of obesity.

The S. TSH was significantly higher in obese subjects whereas total S. T3 and total S. T4 were significantly lower (Table 2 and Table 3). Similar results were obtained by Bastemir et al. who reported that degree of obesity as measured by BMI was associated with higher TSH levels.[11] Also, Myers et al. found a negative association between BMI, and T3, T4.[12] The relationship between thyroid function and obesity observed in our study could be caused by signals from adipose tissue or by thyroid hormone resistance in peripheral tissue metabolism due to obesity.

S. TSH levels were found to be higher in older adulthood group in both normal and obese subjects; however, values were not statistically significant (Table 4 and Table 5). Age has been shown to affect thyroid function; studies like the one done by Hollowell et al. have shown that TSH levels increase with age when iodine intake is sufficient in a population.[13]

The identification of change in thyroid function as a risk factor for weight gain might help in the identification, prevention, and treatment of individuals at risk for the development of excess adiposity. Since S. TSH level shows consistent change in present study, it can be used as an indicator of thyroid function. The thyroid hormone profile was different with obesity and other physical parameters; hence it is important that these factors are taken into consideration during interpretation of thyroid hormone profile.

Table 1. BMI in different gender and age group.

	BMI (Mean ± SD) (n=84)			**p value**
Gender	**Male (n=39)**	**Female (n=45)**		
	24.81 ± 4.08	24.77 ± 3.70		0.96
Age group	**Young Adulthood (13-24 years) (n=16)**	**Middle Adulthood (25-44 years) (n=31)**	**Older Adulthood (45-65 years) (n=37)**	
	22.40 ± 3.66	23.79 ± 2.89	26.66 ± 3.85	< 0.01

Table 2. Thyroid hormone profile in Normal and Obese study groups.

	Normal (n=25)	**Obese (n=59)**	**p value**
	Mean ± SD	**Mean ± SD**	
S. TSH (mIU/L)	2.69 ± 1.35	3.56 ± 1.39	0.01*
S. T3 (ng/dl)	109.95 ± 32.90	93.74 ± 22.06	0.03*
S. T4 (μg/dl)	8.63 ± 1.21	7.91 ± 1.53	0.04*

Table 3. Thyroid hormone profile in different grades of BMI.

BMI Grade (n=84)	Normal (18.50 - 22.99) (n=25)	Over-weight (23.00 – 24.99) (n=25)	Obese (≥ 25) (n=34)	p value
S. TSH (mIU/L)	2.69 ± 1.35	3.02 ± 1.31	3.96 ± 1.33	< 0.01
S. T3 (ng/dl)	109.95 ± 32.90	99.89 ± 24.62	89.21 ± 19.09	0.01
S. T4 (μg/dl)	8.63 ± 1.21	8.45 ± 1.63	7.51 ± 1.34	0.01

Table 4. Thyroid hormone profile in different age groups in Normal subjects.

Normal (n=25)	Young Adulthood (n=09)	Middle Adulthood (n=11)	Older Adulthood (n=05)	p value
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	
S. TSH (mIU/L)	2.50 ± 1.05	2.45 ± 1.30	3.56 ± 1.83	0.28
S. T3 (ng/dl)	114.69 ± 21.74	106.55 ± 34.55	108.92 ± 49.80	0.87
S. T4 (μg/dl)	8.70 ± 0.88	8.49 ± 1.25	8.83 ± 1.80	0.87

Table 5. Thyroid hormone profile in different age groups in obese subjects.

Obese (n=59)	Young Adulthood (n=07)	Middle Adulthood (n=20)	Older Adulthood (n=32)	p value
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	
S. TSH (mIU/L)	3.30 ± 0.88	3.60 ± 1.46	3.60 ± 1.47	0.87
S. T3 (ng/dl)	99.78 ± 26.55	95.26 ± 20.98	91.28 ± 22.08	0.61
S. T4 (μg/dl)	7.81 ± 0.77	8.02 ± 1.51	7.86 ± 1.69	0.92

CONCLUSION

BMI increases with age. Obesity is associated with increased S. TSH and lower total serum T3 and T4. Thus, obesity is associated with decreased thyroid gland function while age does not significantly affect the thyroid function.

Conflict of Interest: No conflict of interest was reported about this article. This study was not funded by any person or organization.

Ethical Clearance: Ethical clearance was obtained from Institutional Ethics Committee of Smt. NHL Municipal Medical College, Ahmedabad, Gujarat, India.

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Comparative Study of Pulmonary Functions in Swimmers and Non Swimmers of 20-25 Years Age Group of Indore City

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ABSTRACT

Background and aim: Swimming is considered to be a very good exercise for maintaining proper health and also has a profound effect on the lung function of an individual. Regular swimming practice should produce a positive effect on the lungs by increasing the pulmonary capacity and thereby improving the lung functions. The purpose of choosing swimmers instead of any other sportspersons was that previous studies have shown that swimming produces the maximum effect on the lungs compared to any other sport.

Material & method: Present study had been carried out on 20 healthy male swimmers volunteers in between 20-25 years age group. 20 students of the same age group, who were not engaged in any kind of sport, were chosen as controls. The pulmonary function tests were recorded with the RMS Helios 702 spirometer. The pulmonary function test were compared between swimmers & non swimmers with the Paired and unpaired't' test was used at appropriate places as a statistical test. The p -value <0.05 was considered significant.

Result: A significant increase in pulmonary function test was observed in swimmers as compared to non swimmers.

Conclusion: Regular swimming practice may tend to alter the elasticity of lungs and chest wall which lead to an improvement in the lung functions of the swimmers. Thus swimming produces maximum effects on the lungs and higher values for lung volumes and flow rates in swimmers. Such exercises when undertaken in milder forms could be used in the rehabilitation process for the patients recovering from asthma and other lung diseases.

***Keywords**: Exercise, Lung, Pulmonary function, Swimmer*

INTRODUCTION

Exercise performed regularly is beneficial to the body as it increases more nutrients and oxygen to the various organs of the body, thus improving their functions [1] .There are studies in the past to show that regular physical activity slows the rate of decline of most of the physiological parameters that we associate with health and fitness-viz muscle strength, aerobic capacity, reaction time and joint flexibility [2] .Previous studies in this field have shown that sportspersons have higher values of lung volumes in comparison to their control counterparts who are not engaged in any kind of regular physical exercise [3] .There are a number of factors on which pulmonary functions depend in normal individuals like age, sex,race, ethnicity and geographical location of the subject [4] .Apart from this , pulmonary function is associated with height, weight and body mass index of the subject after adjusting for other factors such as age, race, sex, asthma and smoking status in populations that are at risk for reduced lung function [5, 6] . Sportsmen are known to have power and high degree of endurance accompanied by greater flexibility of the joints. The thoracic and abdominal muscle strength plays an important role in most of the pulmonary functions.

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And in the sportsmen these muscles are very well developed. Swimming is also no exception. Swimming is considered to be a very good exercise for maintaining proper health and also has a profound effect on the lung function of an individual. Studies have shown that swimming produces the maximum effect on the lungs compared to any other sport [7]. Regular swimming practice should produce a positive effect on the lungs by increasing the pulmonary capacity and thereby improving the lung functions. Also Regular practice of swimming is useful in increasing strength in the chest and abdominal muscles. And thus it helps in improving strength in respiratory muscles & ultimately pulmonary functions. The aim of choosing swimmers instead of any other sportspersons was that previous studies have shown that swimming produces the maximum effect on the lungs compared to any other sport. Such exercises when undertaken in milder forms could be used in the rehabilitation process for the patients recovering from asthma [8] and other lung diseases. Heir et al have shown that respiratory tract infection was associated with a transient increase in bronchial responsiveness in athletes performing physical training during the symptomatic period of the respiratory illness [9] .The purpose of the present study was therefore to investigate the pulmonary function in swimmers and comparison of this with that of non swimmers of same age group.

MATERIALS & METHOD

The present study was conducted on 20 healthy male swimmers who regularly swam a distance of 2 to 5 km, 6 days in a week –for at least 6 months. Age, sex, height and weight-matched 20 controls were obtained .They are in age range of 20-25 years. The experimental protocol was explained to them and written consent obtained. All the procedures were non-invasive and the study plan was approved by the Ethics Committee of Index Medical College Hospital & Research Centre, Indore. All the subjects were healthy and free from any cardio-respiratory ailments and were not on any medication. Smokers, subjects with diabetes, hypertension and chronic respiratory problems like asthma, tuberculosis were also excluded from the study. And their physical characteristics like height, weight and age, which have a role to play in determining the lung volumes, have been taken. Pulmonary Function Tests (PFT*)* was recorded by RMS –HELIOS 702 made in India (Chandigarh)-a computerized spirometer.

The parameters of PFT included in the study were - FVC (Forced vital capacity), FEV1 (Forced expiratory volume in 1st second) and PEFR (Peak expiratory flow rate).All parameters were recorded during morning hours 7.30am to 9.30am. The subjects were made familiar to the machine and were taught its usage. After repeated practice of using the machine, their pulmonary function tests (PFT's) were recorded. The subjects were instructed to inhale and exhale normally and then after taking a forced inspiration they were asked to expire forcibly into the nozzle of the machine. Three readings of all the tests were recorded and the best of the three was taken into account. The parameters taken into account in this study were Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV1) and Peak Expiratory Flow Rate (PEFR).

Each of them was given half an hour rest before conducting pulmonary function test. Each subject was given two trials and three test runs for each test and best of the three test readings was taken.

Statistical analysis: The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. The variables were assessed for normality using theKolmogorov-Smirnov test. Descriptive statistics were calculated. The data were analyzed using student 't' test. P values <0.05 were considered significant.

OBSERVATION & RESULTS

The pulmonary function tests were studied in 20 male swimmers and 20 matched controls of Indore city that formed the study group. The range of age of volunteer student was from 20-25 years. The results were tabulated and statistically analyzed. Table number 1 shows that FVC in swimmers was 4.18±0.20 Lit and FVC in non-swimmers was 3.87±0.05 Lit .And the difference between two were found to be statistically significant (P = 0.0001). FEV-1 in swimmers was 3.34±0.16 Lit and FEV-1 in non swimmers was 3.10±0.04 Lit. And the difference between two were found to be statistically significant (P = 0.0001). PEFR in swimmers was 9.90±0.38 Lit/sec and PEFR in non-swimmers was 8.66±0.18 Lit/sec. And the difference between two were found to be statistically significant (P = 0.0001).

TABLE I: Comparison of pulmonary function tests of swimmers (n=20) and controls (n=20)

Parameters	Swimmers	Control(non-swimmers)	'P' value
FVC(Lit)	4.18±0.20	3.87±0.05	0.0001*
FEV-1(Lit/sec)	3.34±0.16	3.10±0.04	0.0001*
PEFR(Lit/sec)	9.90±0.38	8.66±0.18	0.0001*

(Data presented are mean ±SD,*p<0.05=significant, FVC=Forced Vital Capacity, FEV-1=Forced Expiratory Volume in one second, PEFR=Peak Expiratory Flow Rate)

DISCUSSION

The results discussed above clearly indicate that the swimmers had higher values of lung functions compared to that of the controls; thereby confirming that regular exercise/practice of swimming has a facilitating effect on the lung functions. Similar results have been obtained by other workers in this field [10, 11, 12, 13]. This change could be attributed to the ventilatory stress that the swimmers have to endure. The possible explanation for this better lung functions could be manifold. Regular swimming practice may tend to alter the elasticity of the lungs and the chest wall which leads to improvement in the lung function of swimmers [7]. Swimming differs from the other sports in the following aspects [1]

i. Swimming is performed in the horizontal position compared to the vertical position in other sports.

ii. The external pressure is higher as the density of the surrounding medium is higher than that of air which is the usual external medium in other sports.

iii. The ventilation is restricted in every respiratory cycle for one moment or the other, producing a condition of intermittent hypoxia.

This intermittent hypoxia sets up the anaerobic process during swimming. The lactic acid levels in the blood go on rising resulting in "Lactic Oxygen deficit" [14]. This leads to the stimulation of the respiratory center in the medulla therefore increasing the respiration.

So the respiratory muscles and the diaphragm of the swimmers are required to develop greater pressure as a consequence of immersion in water during the respiratory cycle, thus leading to functionally better respiratory muscles. These factors when combined together play an important role in developing better lung functions in swimmers compared to the other sportsmen [1]

Increased elasticity of lungs & chest wall leads to improvement of lung functions in swimmers [15] .And it could be presumed that during swimming the external pressure is high; therefore the respiratory muscles along with the diaphragm have to develop greater pressure for respiration [7]. This may lead to the improvement in the functional capacity of these muscles as it has been reported that specific training of ventilatory muscles increases the muscle endurance and also the capacity to sustain high levels of ventilation [16]. Hypoxia may also have a role to play. And this intermittent hypoxia faced by the swimmer due to restricted ventilation may lead to alveolar hyperplasia, thereby increasing the lung capacity [13].

This study goes on to suggest that regular exercise training has an important role to play in determining and improving lung volumes. Therefore regular swimming exercises, in milder forms could well become a part of the rehabilitation programme of patients recovering from COPD and other lung ailments [1].

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Evaluation of Interictal Blood Pressure and Heart Rate Response to Standing in Patients with Epilepsy Secondary to Neurocysticercosis

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ABSTRACT

Context (Background): Neurocysticercosis is the most common parasitic disease of the nervous system in humans and the single most common cause of acquired epileptic seizures in the developing world. The interaction between seizures and the autonomic nervous system is very complex and is likely to be multifactorial, involving both the sympathetic and parasympathetic divisions.

Aims: To evaluate interictal autonomic functions in patients with epilepsy secondary to neurocysticercosis, a potentially eradicable disease in our country.

Settings and design: A case control study was carried out in Physiology and Neurology departments of Christian Medical College & Hospital, Ludhiana.

Materials and method: Fifty patients with previously diagnosed epilepsy secondary to neurocysticercosis were included in the study along with fifty healthy control subjects. After taking a history of the epileptic disorder and its treatment were subjected to cardiovascular function.

Statistical analysis: We have analyzed data using ANOVA, students 't' test and Chi square test.

Results and Conclusion: The present study suggests that in patients of neurocysticercosis, in the interictal period, the cardiovascular autonomic dysfunction is primarily parasympathetic in nature with sparing of sympathetic functions.

Keywords: *neurocysticercosis, sphygmomanometer (Diamond), ECG machine, epilepsy, interictal autonomic function tests.*

INTRODUCTION

The autonomic nervous system is a complex neural network maintaining internal physiologic homeostasis. Autonomic failure may accompany diseases of the central nervous system (CNS).[1] The ANS can be assessed by several tests including cardiovascular system, sweating, pupillary reflex and skin tests. However cardiovascular reflex tests have been most widely used as they are non-invasive, results are easy to reproduce and they reflect the state of ANS throughout the body. [2]

We know that Epilepsy is the commonest neurological condition affecting people of all ages, race and social class.There are an estimated 50 million people with epilepsy in the world, of whom up to 75% live in resourcepoor countries with little or no access to medical services or treatment [3,4].

As many people with epilepsy may not come to medical attention, either through ignorance or lack of awareness of the symptoms therefore particularly true of absence and minor complex partial seizures, which may only be recognised in retrospect following presentation with a generalised seizure[5].

To know in one study of general practices only 20% of patients with seizures suspected the diagnosis prior to

medical consultation[6].

Neurocysticercosis, the infection caused by the larval stage of the tapeworm *Taenia solium,* can cause almost any neurological symptom; late-onset epilepsy and intracranial hypertension are its most common clinical manifestations.[7] Evaluation of autonomic cardiovascular reflexes in patients with epilepsy indicates dysfunction of both the sympathetic component and the parasympathetic division.[8]

Given the estimated disease burden of active epilepsy attributable to a potentially eradicable infestation like neurocysticercosis this study was undertaken to assess autonomic function in the interictal period among patients with epilepsy secondary to neurocysticercosis.

MATERIAL AND METHOD

This study was conducted in the Departments of Physiology and Neurology, Christian Medical College & Hospital, Ludhiana.

The study group included fifty patients, aged 18 years or more, diagnosed to have epilepsy secondary to neurocysticercosis and were under treatment in the Department of Neurology, Christian Medical College & Hospital, Ludhiana. Both out-patients reporting to the Neurology OPD for diagnosis, management and follow-up and in-patients admitted in the Neurology wards were included in the study. Fifty age and gender matched healthy control subjects, with no symptoms of dysautonomia were also included in the study.

The following methods were applied for measurement of cardiovascular parameters:

1. Blood pressure was measured using a standard inflatable sphygmomanometer (Diamond) with Riva-Rocci cuff of appropriate dimension according to the age and build of the subject. The level of measurement was maintained at the level of the heart in all postures to avoid hydrostatic pressure effects on the column.

2. Heart rate was measured by palpation of the radial artery using a standard chronometer.

3. ECG was continuously recorded in standard limb lead II, using BPL ECG machine (Model: CARDIART 108T/MK-VII). Heart rate was also calculated from R-R interval on the ECG using the formula:

HR [beats per minute, BPM] = (paper speed [mm / sec] x 60 [correction factor for conversion of seconds to minutes]) ÷ R-R interval [mm]

Autonomic functions assessment was performed on all subjects in both the study and control groups, using the standard techniques described below:

1. Blood pressure and Heart rate response to standing [orthostatic response][1]:

Blood pressure and heart rate was recorded after the subject had been resting and inactive in the supine position for 20 minutes and then immediately upon postural standing and at 1 and 3 minutes after standing. Standard lead II of ECG was also recorded during this period. The 30:15 ratio (ratio of the longest R-R occurring 30 beats after standing and the shortest R-R occurring 15 beats after standing) was calculated.

STATISTICAL ANALYSIS

Data collected has been recorded and analyzed using Microsoft Office-Excel and Statistical Package for Social Sciences (Windows Version). For comparison of means of autonomic function test values between the two groups, the student's't' test has been used. Chi square test has been used for two-by-two tables, for instance the comparison of gender distribution between the two groups. Relationships between autonomic function test values and characteristics of the disease and its treatment has been analyzed using ANOVA. For the purpose of statistical significance, $p < 0.05$ has been considered as statistically significant.

RESULTS

Majority of the subjects included in the study belonged to the 20-39 years age groups (37, 74% in the Study group and 38, 76% in the Control group). The mean age of subjects in the Study group was 31.96 + 10.09 years with a range of 18 to 59 years. There was no statistically significant difference in the mean ages of the two groups ($t = 0.0569$, $p > 0.10$). The above table also shows the distribution of subjects in the two groups according to gender. There were 32 (64%) males and 18 (36%) females in each group. The male to female ratio was 1:0.56.

Table 2 shows the mean values of the vital signs of the subjects in the two groups.

The mean systolic blood pressure of the subjects in the Study group was 118.60 ± 7.0 mmHg and that of the subjects in the Control group was 118.40 ± 8.66 mmHg, the difference being statistically not significant ($p > 0.10$). The mean diastolic blood pressure of the subjects in the Study group was 76.80 ± 7.68 mmHg and that of the subjects in the Control group was 77.0 ± 7.89 mmHg, the difference being statistically not significant ($p > 0.10$).

The mean heart rate of the subjects in the Study group was 77.54 ± 14.10 bpm and that of the subjects in the Control group was 73.78 ± 9.56 bpm, the difference being statistically not significant ($p > 0.10$).

Table 3 shows the systolic blood pressure response to orthostatic challenge, i.e. to postural standing.

Immediately upon standing from a supine position, the mean systolic blood pressure (SBP) of the subjects in the Study group was 107.32 ± 7.71 mmHg and that in the Control group was 106.68 ± 8.53 mmHg. The difference between the two groups was statistically not significant ($p > 0.10$).

The mean fall in the systolic blood pressure from the resting values at this stage was 11.28 mmHg in the Study group and 11.72 mmHg in the Control group.

At 1 min after standing the mean SBP of the subjects in the Study group was 108.20 ± 7.97 mmHg and that in the Control group was 108.24 ± 7.94 mmHg, the difference being statistically not significant ($p > 0.10$).

At 3 min after standing the mean SBP of the subjects in the Study group was 114.28 ± 8.13 mmHg and that in the Control group was 116.60 ± 9.73 mmHg, the difference being statistically not significant ($p > 0.10$).

Table 4 shows the diastolic blood pressure response to orthostatic challenge, i.e. to postural standing.

Immediately upon standing from a supine position, the mean diastolic blood pressure (DBP) of the subjects in the Study group was 87.96 ± 7.67 mmHg and that in the Control group was 87.08 ± 7.83 mmHg. The difference between the two groups was statistically not significant ($p > 0.10$). Compared to the resting values, DBP on an average was found to increase immediately upon standing in both the groups.

At 1 min after standing the mean DBP of the subjects in the Study group was 86.20 ± 6.88 mmHg and that in the Control group was 85.04 ± 7.70 mmHg, the difference being statistically not significant ($p > 0.10$).

At 3 min after standing the mean DBP of the subjects in the Study group was 81.08 ± 7.69 mmHg and that in the Control group was 79.20 ± 8.41 mmHg, the difference being statistically not significant ($p > 0.10$).

Table 5 shows the heart rate response to orthostatic challenge, i.e. to postural standing.

Immediately upon standing from a supine position, the mean heart rate (HR) of the subjects in the Study group increased from baseline values to 98.92 ± 13.46 bpm and that in the Control group to 98.00 ± 11.97 bpm. The difference between the two groups was statistically not significant ($p > 0.10$).

At 1 min and 3 min after standing the mean HR of the subjects in the Study group was 90.54 ± 13.50 bpm and 83.44 ± 12.39 bpm respectively. The difference from the control group was statistically not significant ($p > 0.10$).

The mean of the averaged resting RR interval on lead II of the ECG was found to be 19.92 ± 3.29 mm among the subjects in the Study group, while that in the Control group was found to be 20.64 ± 2.62 mm which was not statistically significant ($p > 0.10$).

On performing the Valsalva strain, the ratio of the maximal to minimal heart rate (the Valsalva ratio) was calculated and the mean Valsalva ratio was found to be 1.61154 ± 0.34 in the Study group and 1.78370 ± 0.36 in the Control group. This difference between the two groups with the regard to the Valsalva ratio was found to be statistically significant ($p < 0.05$).

DISCUSSION

In the present study, immediately upon standing from a supine position, the mean systolic blood pressure (SBP) of the subjects in the Study group and that in the Control group did not show any statistically significant difference ($p > 0.10$) as similar with the previous study by Isojarvi et al[9] and Ansakorpi et al.[8]

In this study, the mean diastolic blood pressure (DBP) of the subjects immediately upon standing, at 1 min and at 3 min after standing did not show any statistically significant difference between the two

groups ($p > 0.10$ in all cases). Compared to the resting values, DBP on an average was found to increase immediately upon standing in both the groups.

The heart rate response to orthostatic challenge did not differ significantly between the two groups immediately upon standing from a supine position, at 1 min and at 3 min after standing.

The studies by Isojarvi et al[9], Ansakorpi et al[8] and Sathyaprabha et al[10] showed significant impairment in the heart rate variability to orthostatic challenge, thus indicating a cardiovagal defect.

Table 1: Distribution according to age and gender

Age groups (years)	Study Group		Control Group	
	N	%	n	%
< 20	3 (M-2, F-1)	6	1 (M-1, F-0)	2
20-29	20 (M-17, F-3)	40	22 (M-10, F-12)	44
30-39	17 (M-7, F-10)	34	16 (M-13, F-3)	32
40-49	7 (M-5, F-2)	14	6 (M-6, F-0)	12
≥ 50	3 (M-1, F-2)	6	5 (M-2, F-3)	10
Total	**50 (M-32, F-18)**	**100**	**50 (M-32, F-18)**	**100**
Range	18-59		19-56	
Mean ± SD	31.96 ± 10.09		33.10 ± 9.94	

Table 2: Mean values of baseline vital signs

Baseline vital signs	Study Group		Control Group		p value
	Mean	SD	Mean	SD	
Systolic blood pressure (mmHg)	118.60	7.00	118.40	8.66	0.899
Diastolic blood pressure (mmHg)	76.80	7.68	77.00	7.89	0.898
Heart rate (bpm)	77.54	14.10	73.78	9.56	0.122

Table 3: Systolic blood pressure response to orthostatic challenge

Time of Measurement	SYSTOLIC BLOOD PRESSURE (mmHg)				p value
	Study Group		Control Group		
	Mean	SD	Mean	SD	
Resting	118.60	7.00	118.40	8.66	0.899
Immediately upon standing	107.32	7.71	106.68	8.53	0.695
1 min after Standing	108.20	7.97	108.24	7.94	0.980
3 min after Standing	114.28	8.13	116.60	9.73	0.199

Table 4: Diastolic blood pressure response to orthostatic challenge

Time of Measurement	DIASTOLIC BLOOD PRESSURE (mmHg)				p value
	Study Group		Control Group		
	Mean	SD	Mean	SD	
Resting	76.80	7.68	77.00	7.89	0.898
Immediately upon standing	87.96	7.67	87.08	7.83	0.571
1 min after Standing	86.20	6.88	85.04	7.70	0.429
3 min after Standing	81.08	7.69	79.20	8.41	0.246

Table 5: Heart rate response to orthostatic challenge

Time of measurement	HEART RATE (bpm)				p value
	Study Group		Control Group		
	Mean	SD	Mean	SD	
Resting	77.54	14.10	73.78	9.56	0.122
Immediately upon standing	98.92	13.46	98.00	11.97	0.719
1 min after standing	90.54	13.50	88.70	12.33	0.478
3 min after standing	83.44	12.39	83.20	11.79	0.921
	Study Group		Control Group		p value
	Mean	SD	Mean	SD	
30:15 ratio	1.06	0.08	1.09	0.12	0.096

CONCLUSION

The present study suggests that in patients of neurocysticercosis, in the interictal period, the cardiovascular autonomic dysfunction is primarily parasympathetic in nature with sparing of sympathetic functions.

Ethical Clearance- Yes

Source of Funding- Self.

Conflict of Interest - None

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Investigating the Association of Maximum Hand Grip Strength with Hand Circumference and Hand Length in Male Adults

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ABSTRACT

Background: Maximal Hand Grip Strength (MHGS) correlates with nutrition, overall body strength, morbidity and mortality. Several factors influences the MHGS such as age, gender, body height, weight, bone mineral density, hand dominance, forearm circumference, arm circumference, occupation, social status, lifestyle, physical and psychosocial variables.

Aims and Objective: The objective of the study was to analyze association between maximum hand grip strength and hand circumference and/or hand length using a standardized protocol.

Material & Method: This cross sectional study included 40 healthy male subjects of age 18-60 years**.** Anthropometric variables such as forearm circumference, wrist circumference and hand circumference, hand length were measured using flexible measuring tape for dominant hand. A hand-held dynamometer was used to measure MHGS in kilograms. Pearson's correlation coefficient test was applied to study the correlation.

Results: Height, hand circumference and hand length had significant positive correlations with MHGS. Age was significantly negatively correlated with MHGS whereas forearm circumference and BMI were not related significantly to MHGS.

Conclusion: Hence, It explored that maximum handgrip strength (MHGS) of healthy population is significantly influenced by the hand length, hand circumference, age and height of the subjects

Keywords: *Hand Grip, Circumferential Measurement, Strength, Dynamometer.*

INTRODUCTION

Muscle strength refers to the maximum force generated by a specific muscle or muscle group. Several studies indicate that muscular strength was significantly and inversely associated with overall mortality rates and morbidity and mortality due to various chronic diseases. These associations have been demonstrated to be independent from other major risk factors and cardio respiratory fitness. Among all muscle function tests, measurement of hand grip strength has gained attention as a simple, non-invasive marker of muscle strength of upper extremities, well suitable for clinical use.[1]

Hand grip strength (HGS) has been found suitable for use as an independent nutrition assessment tool.[2] It is an independent predictor of composite renal outcomes in non-dialysis-dependent chronic kidney disease patients.[3] It has been found to be useful for forecasting prognosis in patients with chronic heart failure.[4] Handgrip strength is associated with mortality in the general population and in patients with COPD.[5] Hand grip strength (HGS) is a sensitive tool for predicting the complications and survival of patients having alcoholic liver disease .[6]

Muscle weakness is also associated with an increased rate of diabetes in older male and female subjects.[7] Decreased MHGS can cause significant functional limitation, hence less physical activity. The

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quality of life depends upon mental and physical activity level.

One of the most common methods of measuring muscle strength is the isometric hand grip strength test. It is a simple, inexpensive and sensitive tool. Hand grip strength can be quantified by measuring the amount of static force that the hand can exert on a dynamometer. It is a reliable measurement when standardized methods and calibrated equipment are used.

Grip strength has been found to be associated with numerous factors such as age, gender, body height, weight, bone mineral density, hand dominance, forearm circumference, arm circumference, occupation, social status, lifestyle and physical and psychosocial variables.[8-17]

There are very few studies establishing the association of maximum hand grip strength with hand circumference and hand length. If this association is established and more categorizations are added to the reference data for handgrip strength, it will be possible to use the maximum hand grip strength as a more accurate and sensitive tool for various studies.

So this study was undertaken to evaluate the effect of hand circumference and hand length variability on maximum hand grip strength.

AIMS & OBJECTIVE

1. To find if any association exists between maximum hand grip strength and hand circumference and/or hand length.

2. To study association between forearm circumference and hand grip strength.

MATERIAL & METHOD

This was a cross sectional conducted in the Physiology department at IGIMS, Patna after obtaining approval from institutional ethics committee.

The study included 40 healthy male subjects of age 18-60 years. Informed written consent was taken from all the participants after being provided by a brief description of study.

Subjects with recent hand injury or surgery, hand deformity, swelling or pain in hand, any neurological, cardiovascular or respiratory disease were excluded from the study. Prior to commencement of data collection, a practice trial was undertaken to familiarize the subjects with the procedure.

Anthropometric measurements- Age was recorded for each subject. A digital weighing machine to the nearest 0.1kg was used to measure the weight. Subjects were weighted with their shoes off wearing light indoor clothes. Height was measured without shoes with the use of stadiometer to nearest 0.1 cm. BMI was ten calculated as body eight measured in kilograms divided by square of body height in meters.

Hand circumference was measured at maximum hand width by flexible measuring tape in centimeters. Hand length was measured from distal wrist crease to the tip of middle finger by using flexible measuring tape in centimeters.

For hand grip strength estimation, subjects were asked to loosen up the hands and fingers by doing warm-up exercises i.e. shaking both hands three times and bending and stretching all fingers three times. Then the subject were asked to grasp the dynamometer (B.D.Instruments) between fingers and the palm at the base of the thumb of the dominant hand holding the dynamometer in line with the forearm at thigh level so that it was not touching the body. Subjects were instructed to squeeze the dynamometer maximally three times with a gap of 60 seconds to find the maximum voluntary contraction (MVC). All the tests will be carried out at the same time of the day, at 10 am and 11 am to avoid possible diurnal variations. During the tests, maximum effort from the subjects was ensured by adequately motivating them to perform at their optimum level. All tests were conducted by the same person to avoid inter-observer variation.

Pearson's correlation coefficient test was applied to study the correlation.

RESULTS

A total of 40 healthy male subjects, having Mean ± SD age of 33.82 ± 12.07 years (ranging between 18-60 years) participated in this study. All of the study subjects were right hand dominant. The anthropometric measurements are presented in Table 1.

Table-1: Mean and Standard Deviation of Descriptive Statistics for Age, Height, Weight, BMI, Hand Circumference and Hand Length in the Study (n=40)

Anthropometric Characteristics	Mean ± SD
Age (years)	33.82 ± 12.07
Height (m)	1.63 ± 0.07
Weight (kg)	56.88 ± 8.69
BMI (kg/m²)	21.52 ± 3.53
FC (cm)	24.93 ± 1.66
HC (cm)	19.79 ± 0.8
HL (cm)	18.59 ± 0.99
MHGS (kg)	19.04 ± 4.59

BMI, body mass index, FC, Forearm circumference, HC, Hand circumference, HL, Hand length, MHGS, Maximum hand grip strength

A Pearson correlation coefficient for age, height, weight, BMI, forearm circumference, hand circumference, hand length with hand grip strength is presented in Table 2.

Table-2: Pearson correlation between anthropometric variables and maximum hand grip strength in healthy male subjects (n=40)

Parameters	R(correlation coefficient)	Significance P
Age (years)	-0.41978	<0.01 (HS)
Height (m)	0.503527	<0.01 (HS)
Weight (kg)	0.248443	>0.05 (NS)
BMI (kg/m²)	-0.08208	>0.05 (NS)
FC(cm)	0.263406	>0.05 (NS)
HC(cm)	0.454641	<0.05 (S)
HL(cm)	0.523718	<0.01 (HS)

HS-Highly significant, S- Significant, NS-Not significant (2-tailed)

BMI, body mass index, FC, Forearm circumference, HC, Hand circumference, HL, Hand length, MHGS, Maximum hand grip strength

Maximum handgrip strength has significant positive correlations with height, Hand circumference and Hand length of the subjects whereas age has a significant negative correlation with maximum handgrip strength.

DISCUSSION

Many daily functions require high activity levels of the flexor musculature of the forearms and hands. These muscles are involved in gripping strength. Grip strength correlates with overall body strength, [18] and several factors influence the grip strength. [19]

In this study factors like height, Hand circumference and Hand length have significant positive correlations with maximum handgrip strength. On other hand, age is significantly negatively correlated with maximum handgrip strength.

In case of height, the positive correlation (R=0.503527) with the hand grip strength could be due to various factors such as with greater heights that would lead to longer arms, with greater lever arm force generation, resulting in an efficient amount of force.[20]

Age is negatively correlated(R=-0.41978) with maximum handgrip strength (MHGS) in this study. It can be explained by the decline in musculoskeletal strength and mass associated with aging.[21]

MHGS is not significantly correlated with weight and BMI. Koley S *et al.* also reported that weight and BMI is not associated with MHGS in Indian collegiate population.[22]

Hand circumference and Hand length (the distance from wrist joint to the tip of middle finger) are found to be in strong positive association with MHGS, in present study with R value 0.454641 and 0.523718 respectively. This finding is similar to the report from study by Alahmari K *et al.*[23] and Eidson C *et al.*[24] showing strong correlation of MHGS with hand circumference and hand length. Hager-Ross C *et al*, investigating children at different ages, confirmed that hand length is an important variable for handgrip strength.[25]

In this study forearm circumference is not related significantly to MHGS contrary to few studies.[23,24] The possible basic reason could be that the skeletal muscle histology and histo-chemical parameters among the present study population would have accounted for the difference when compared to other studies.[26]

CONCLUSION

In conclusion, the present study provides a sample of healthy adult male data on hand grip strength for clinical use. It explored that maximum handgrip strength (MHGS) of healthy population is significantly influenced by the hand length, hand circumference, age and height of the subjects.

Ethical Clearance- Taken

Source of Funding- Self

Conflict of Interest - Nil

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A Comparative Study on Effect of Various Warm up Methods in Untrained Students

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ABSTRACT

Background: A normal untrained individual remains perplexed about which warm-up one should perform to get the maximum benefits. Aim of present study was- which warm-up has better effect on exercise in untrained individuals.

Parameters- Aerobic capacity and time taken to complete exercise were considered.

Method: It is a cross-sectional study conducted at GCS Medical College, Ahmedabad during the January 2015 with the permission of ethical committee of Institute and after written informed consent 30 (out of total 61) apparently healthy untrained medical students were randomly enrolled after exclusion. They were called at regular interval to perform Rockport Fitness Walking Test (RFWT) to calculate aerobic capacity by 3 steps: - 1st control exercise without warm up, 2nd RFWT following dynamic stretching and 3rd RFWT following static stretching. Parameters recorded were incorporated in RFWT formula to calculate aerobic capacity

Results: Subjects took significantly less time (14.45± 1.45 minutes, $p < 0.05$) to complete step 2 than step 1 control. But none showed any significant improvement in aerobic capacity. Conclusions: Dynamic stretching decreases time taken to complete exercise hence should be preferred for activities requiring more speed.

Keywords- *Dynamic stretching; Rockport Fitness Walking Test (RFWT); Static stretching; Untrained; VO2max; Warm up*

INTRODUCTION

It has been a matter of debate since long whether warm-up [(1)] has any effect on exercise and in which manner.Various studies have shown that dynamic stretching has benefits over static stretching in trained person [(2) (3)] and even vice-versa [(4)].

A lot of studies have been carried out on the effect of warm-up on trained professionals in western countries. But very few have been carried out focusing on whether war-up has any effect on the exercising capacities and parameters of a normal untrained individual who does not carry out any regular exercise. Rockport Fitness Walking Test (RFWT) [(5)] has been found to be the most accurate [(6)] and reliable [(7)]and cheap method to calculate the VO_2 max [(8)] and thereby aerobic capacity.

The present study aims at finding whether, and if yes then to what extent, warm-up affects the time taken to complete exercise and aerobic capacity of an untrained adult individual in order to make him aware how a particular stretching will affect his exercise. The warm up methods have an incremental effect on aerobic capacity [(9)].

There are various types of warm up methods which include passive and active warm up. The active warm up can be achieved by dynamic stretching, static stretching and ballistic stretching. Dynamic stretching are active repetitive movements of muscle that brings forth a stretch but are not held in the end position. Dynamic

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stretching has shown to bring out better performance in terms of agility and movement time [10].

MATERIAL AND METHOD

This cross-sectional study was approved by the scientific and ethical committees at *The Gujarat Cancer Society Medical College, Hospital and Research Centre, Ahmedabad*. All the subjects were explained about the procedure and they signed the institutionally approved consent form explaining the benefits and risks of the process. All the information about the participants were kept confidential

The study was started in the month of January 2015.

The selection criteria:-

- *Inclusion criteria:* Apparently healthy untrained medical students.

- *Exclusion criteria*:

o *Regular exercise*: students performing regular physical activity.

- Regular exercise criteria included anyone who regularly performed exercises or any sport activity such as walking, jogging, running or other such activities for a period of one month or more. Indoor games were not included in this criterion.

o *ECG screening*: students with abnormal ECG or history of any major illness.

- ECG screening was carried out at associated hospital by the trained technician and was confirmed by physician prior to recruitment in the study.

- The students were asked if they had history of any major illness. Those having such history were excluded.

The students studying at above mentioned college were enrolled as subjects for the study. 84 medical students aged 17-19 years were randomly approached for this purpose. Finally 61 healthy students who were not performing any kind of regular exercise and with no cardiac anomaly were enrolled as subjects for this study. In order to remove any bias on basis of height weight or other parameters, each of the subjects was called 3 times between 8am to 12noon, each time to execute according to a different format. In order to eliminate any effect due to previous step, a gap of minimum one week was kept between each step. Height, weight, age and sex of the subjects were recorded prior to recruitment into the study. The steps were-

Step 1 - direct exercise (control step)

Step 2 - dynamic stretching [11] for 5 minutes followed by exercise

Step 3 - static stretching [12]for 5 minutes followed by exercise

Table 1 Subject enrollments for the study

SUBJECTS	NO.
Random enrollment	84
Doing regular exercise	09
Abnormal ECGs screened	14
Included in study	61

The exercise performed was Rockport Fitness Walking Test (RFWT) [5], according to which the subject had to walk on treadmill (Fitking® W-890) for a distance of 1 mile at the fastest walking speed. Before starting any step, resting heart rate and blood pressure were recorded. The heart rate was recorded from radial artery using three finger techniques. The blood pressure was recorded using a mercury sphygmomanometer. On completion the warm up, the heart rate and blood pressure were again recorded in similar manner as before, within 2 minutes of the warm up. Soon after taking the recordings, it was made to perform RFWT. After completing the exercise, the heart rate and blood pressure were again recorded in similar manner as before, within 2 minutes of the exercise. On basis of various values recorded, VO_2max of individual subject was obtained after each test using the formula [5].

$VO_2 max = 132.853 - (0.0769 \times W) - (0.3877 \times A) + (6.315 \times G) - (3.2649 \times T) - (0.1565 \times HR)$

Where:

- W= Weight in pounds (lbs)
- G= Gender (Male = 1 and Female = 0)
- T= Time in minutes
- HR= Heart rate in beats/minute

- A= Age in years

All the subjects attained their Target Heart Rate (THR) at the end of each format which was 50 % - 65 % of their Maximum Heart Rate (MHR) which confirmed all performed proper aerobic exercise.

The resulting data collected were analyzed by paired ANOVA test using Med Calc® v 12.5.0.0 software. The results obtained were considered significant if the p value obtained was less than 0.05

RESULTS

At the end 30 subjects (15 males and 15 females) aged 18±0.86 years who were successful in completing all the 3 formats and achieved their required THR were considered for result analysis.

The remaining 30 were not able to complete all the 3 formats of the topic and hence their results were not used in the analysis.

Table 2: Results obtained from RFWT test

Parameters	Step 1	Step 2	Step 3
Time taken to complete exercise (RFWT) (in minutes)	15.03±1.7	14.45±1.45*	14.62±1.63
VO_2max (in ml/kg/min)	49.64±6.62	51.25±6.27	51.28±6.79

*- the results showed significance while comparing the results of time taken to complete RFWT in Step 1 and 2.

As mentioned above in Table 2, Time taken to complete Rockport Fitness Walking Test exercise revealed significantly lower value after performing dynamic stretching ($p < 0.05$) as compared to without warm up ($p > 0.05$) and static stretching ($p > 0.05$). VO_2 max did not show any significant change on performing warm up before exercise.

DISCUSSION

Vaz, Mendes and Brito(2007) who carried out a similar study on 14 untrained men, showed that after dynamic stretching, subjects completed 100meter race faster than other stretching and control group [13] this is in agreement with results of our study that when the subjects performed RFWT followed by dynamic stretching they completed exercise faster (in 14.45±1.45 minutes) in comparision to when they performed it without warm up(in 15.03±1.7 minutes) ($p<0.05$)as shown in Table 2.

The results in our study showed resemblance to cases of trained individuals as proven by Little and Williams (2006) in their study- Static stretching does not appear to be detrimental to high-speed performance when included in a warm-up for professional soccer players. However, dynamic stretching during the warm-up was most effective as preparation for subsequent high-speed performance [14]. When the subjects performed exercise followed by static stretching they completed the RFWT in 14.62±1.63 minutes ($p>0.05$) whereas they completed the exercise faster when they performed it after dynamic stretching warm up ($p<0.05$) as shown in Table 2.

Fletcher et al (2004) compared static and dynamic warm ups on 20 meter sprint performance on rugby union players and found out that static may decrease short sprint performance whereas dynamic stretching increase 20-m sprint performance [15]. However we found that static shows no detrimental effect on time taken to complete exercise, but our result is in agreement to their result that dynamic has beneficial effect to complete the exercise faster ($p<0.05$).

However less number of studies have been conducted related to this topic in untrained western population.

Our study showed that in untrained medical students, dynamic stretching type of warm up brought significant decrease in the time taken to complete exercise and thereby increases walking speed. However there are no advantageous results in vital parameters such as blood pressure, heart rate, or even the aerobic capacity when exercise was performed following warm up.

CONCLUSION

Hence dynamic stretching warm up should be recommended to untrained subjects for activities requiring more speed for better results.

Conflict of Interest - No

Source of Funding- Self Sponsored

Ethical Clearance – Yes from Institutional Ethics Committee of GCS Medical College.

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Assessment of Autonomic Functions in the Normotensive Offspring of Hypertensive Parents

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ABSTRACT

Introduction and Aim: Hypertension is inheritable and various genetic mechanisms have been imputed to its causation. Though the genetic mechanisms behind inherited hypertension could be many the early manifestation of the cardiovascular dysregulation is reflected by the altered sympathovagal balance. As sympathovagal balance maintains the normal regulation of cardiovascular system, any disruption in its homeostasis can gradually lead to cardiovascular diseases especially hypertension. Therefore this study has been designed to assess the autonomic functions by the orthostatic test in the normotensive offspring of hypertensive parents.

Materials and method: This cross-sectional observational study was carried out on 50 healthy normotensive volunteers with parental history of hypertension and 50 healthy normotensive volunteers without parental history of hypertension. The change in BP (sympathetic function) and heart rate- 30:15 ratio (parasympathetic test) in response to change in posture was assessed (othostatic test).

Results: The assessment of the sympathetic and parasympathetic components of orthostatic test revealed a statistically significant increase in the sympathetic response and parasympathetic attenuation to change in posture as inferred by the significant difference in responses between the groups.

Conclusion: From the observations of our study it could be inferred that the normotensive offspring of hypertensive parents, though normotensives at rest, had a higher sympathetic response to physical stimuli suggesting sympathetic overactivity, thus making the inference of impaired sympathovagal balance in them.

Keywords: *Autonomic functions, Hypertension, Hypertensive offspring , Sympathovagal balance*

INTRODUCTION

Hypertension is one among the noncommunicable diseases (NCD) which is reported to be the fourth contributor to premature death in developed countries and seventh in developing countries. 13% of global deaths are attributed to increased blood pressure and the recent reports indicate that its prevalence is predicted to be 1.56 billion by 2025. According to Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India, the overall prevalence of hypertension in India by 2020 will be 159.46/1000 population.[1]

Hypertension could be inheritable and the development of familial hypertension is programmed at the level of genes, making the descendants of the family line vulnerable to develop the condition at an earlier stage of life. The risk of developing the condition increases four folds with positive parental history and it is observed that 25% of children with one hypertensive parent and 50% of children with both parents being hypertensive will eventually develop the condition.[2]

Essential hypertension is a hereditary condition that develops as a result of interplay of genes with environmental factors. Gene polymorphism is imputed in the development of hypertensive variables and when these genetic factors interact with hypertensinogenic

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factors like obesity, insulin resistance, salt sensitivity which are also genetically influenced or with modifiable risk factors like sendentary life style, stress, alcohol consumption etc., it leads to the display of a hypertensive phenotype appropriate to the contributing variables.[3,4] Though the genetic mechanisms behind the development of familial hypertension are innumerable, the disease onset manifests as a disturbance in the sympathovagal balance to begin with, which gradually progress towards sympathetic overactivity and parasympathetic attenuation resulting in the disease condition.[5,6,7] It is also observed that these changes become appreciable even in the first decade of life. [8]

As conventional autonomic function tests are readily performed non-invasive procedure in a clinical setting using simple and inexpensive equipment, this study has been designed to assess the BP and heart rate response to change in posture (orthostatic test and 30:15 ratio) among the normotensive offspring of hypertensive parents and infer the impairment of sympathovagal balance by comparing the inferences with that of the normotensive counterparts with no parental history of hypertension.

MATERIAL AND METHOD

This cross sectional observational study was performed in the research lab of Department of Physiology, Sri Venkateshwaraa Medical College Hospital & Research Centre, Puducherry, after obtaining the Institutional Ethical Committee clearance. A total of 100 volunteers both male and female between the age group of 18 to 25 years were recruited from the campus as subjects for this study. These volunteers were divided into two groups as follows,

Group 1 (study): normotensive offspring of hypertensive parents (n=50)

Group 2 (control): normotensive offspring of normotensive parents (n=50)

The volunteers were selected based on the following inclusion and exclusion criteria and there was equal gender distribution in each group.

Inclusion criteria: Volunteers with BP < 120/80 mm Hg (normotensives) and no parental history of diabetes and those who were in the normal range of Body mass index (BMI) (18.5 to 22.9 kg/sq. m.) were recruited for study and control groups.

Exclusion criteria: Smokers , alcoholics , diabetics and those with history of metabolic , renal and endocrine diseases as well as any acute or recent illness were excluded. Yoga practitioners and those who were on any other medication that affects autonomic nervous system were not included.

METHODOLOGY

The subjects were informed about the procedure briefly and an informed written consent was obtained from all the subjects. The subjects were requested not to participate in any exercise or heavy physical activity and to avoid taking a heavy meal just before two hours of the test. The subjects were made to come half an hour prior to the commencement of testing procedure, in order to allow the familiarization with the environment and to establish a resting state and the othostatic test was assessed as follows.

Recording of resting basal values : The basal blood pressure was manually measured by using a mercury sphygmomanometer and the Lead II ECG recording was done using PHYSIOPAC PP4 MEDICAID system, Chandigarh. The ECG recording was done for 5 minutes after 20 minutes of rest in supine posture and basal BP was recorded at the end of ECG recording. Heart rate was calculated from ECG obtained. The subjects were requested not to do any gross body movements, conversation and mental activities while recording the ECG.

Blood pressure response from supine to standing (orthostatic test): After recording the basal blood pressure as described above, the subject was asked to stand leaning against the wall to avoid the effect of muscle-heart reflex ,as quickly as possible (within 3 seconds) and the BP was recorded immediately and 2 minutes and 5 minutes after standing. The change in BP on standing to assesses the integrity of sympathetic system.

Heart rate response from supine to standing [30:15 ratio (R-R interval at beat 30)/(R-R interval at beat 15)] : The heart rate was calculated from ECG recorded in supine posture and immediately on standing. The minimum R-R interval around 15th beat and maximum R-R interval around 30th beat after standing was recorded. The ratio of R-R intervals corresponding to 30th and 15th beat is called 30:15 ratio. This ratio is the measure of parasympathetic function.[9]

STATISTICAL ANALYSIS

The data were expressed as mean±SD. To test the significance between study and control groups unpaired 't' test was done (using SPSS version 17). The statistical probability $p<0.05$ was considered to be significant.

RESULT

Table 1: Comparison of basic parameters of the subjects.

Parameters	Group 1	Group 2	P value
n	50	50	-
Sex (Male/Female)	25/25	25/25	-
Age	20.34± 1.18	20.47± 0.79	0.564
BMI (Kg/m2)	21.70 ± 0.4	21.42 ± 0.3	0.0007 ***
Resting SBP (mm Hg)	111.4 ± 3.82	106.6 ± 4.13	0.0001 ***
Resting DBP (mm Hg)	70.48±3.97	64.14±4.56	0.0001 ***
Resting heart rate (beats/min)	75.42 ±8.71	69.05± 5.46	0.0001***

n- No of participants SBP - Systolic blood pressure DBP - Diastolic Blood Pressure . *P<0.05; ** P<0.01; ***P < 0.001

The above table (table 1) describes the basic parameters of the study and control groups. The study and the control groups differ significantly in their BMI, basal heart rate and BP values in spite of their values being in the normal range.

Table 2: Comparison of Orthostatic Test between the groups

Observation of the Parameters	Group 1	Group 2	P value
Immediate rise in heart rate (beats/min) on standing	11.13±4.08	8.09±2.23	0.0001 ***
Immediate fall in SBP (mmHg) on standing	5.04 ± 2.13	7.8 ± 2.7	0.0001 ***
Immediate rise in DBP (mm Hg) on standing	12.12±3.28	10.11±2.1	0.0016**
Rise in SBP (mm Hg) by 2 min	8.2 ± 4.35	6.04 ± 1.18	0.0033**
Fall in DBP (mm Hg) by 2 min	1.8±0.27	2.3 ± 1.04	0.004**
Fall in SBP (mm Hg) by 5 min	3.2 ± 1.7	4.3 ± 1.20	0.0013***
Fall in DBP (mm Hg) by 5 min	2.11 ± 1.24	3.45± 2.17	0.0011 **
Heart rate response from supine to standing - 30:15 ratio	1.89 ± 0.15	1.56 ± 0.21	0.0001 ***

SBP - Systolic blood pressure, DBP - Diastolic blood pressure. *P<0.05; ** P<0.01; ***P < 0.001

The above table (table 2) demonstrates a normal orthostatic response with values differing statistically with significance between the groups suggesting a higher sympathetic activity in the study population (group 1). The assessment of 30:15 ratio revealed a significant difference between the groups suggesting significantly different parasympathetic response between the groups with higher ratio in the offspring of hypertensive parents.

DISCUSSION

Cardiovascular health is determined by the sympathovagal balance that regulates blood pressure and heart rate. Any disturbance in their regulation leads to hypertension and its sequel. In our study it is observed that participants of both the groups though normotensives, they differed significantly in their basal values of heart rate, systolic blood pressure (SBP) and diastolic blood pressure (DBP) suggesting a slightly higher sympathetic activity in the study population that could have overwhelmed the parasympathetic control, as vagal attenuation could have not occurred due to their younger age and the increased sympathetic activity could be due to higher levels of circulating catecholamines .[10] Though the BMI was within normal range they differed with significance from controls. From these observations

it could be inferred that though both group participants had the basal parameters in normal range, the study group had the sympathovagal balance shifted towards higher sympathetic activity. Researchers, in their attempt to unveil the sympathetic shift in similar population, found that these vulnerable people responded with an enhanced sympathetic response when subjected to mental and physical stress.[11,12] As change in posture is a perfect physiological stimulus to unveil the derangement in sympathovagal balance this study has been designed to assess the effect of change in BP and heart rate in response to change in posture.

The assessment of the orthostatic test revealed the following observations. The sympathetic component assessed by the BP response to change in posture revealed sympathetic overactivity in the study group (group1). In the orthostatic test assessed, a normal baroreceptor reflex response was observed in both the groups. With sudden change from supine to upright posture a fall in SBP was recorded due to venous pooling in the lower limbs that has led to a decrease in venous return. And to compensate for the fall in cardiac output, the baroreceptor reflex mechanism comes into play and attempts to restore the BP to normal was done by activating the sympathetic response that has increased the heart rate and the peripheral resistance, Therefore the immediate SBP recorded with 15 seconds of standing was low and the compensatory increase in sympathetic activity is obvious from the increased heart rate and the DBP recorded. As the recording of DBP following SBP immediately on standing, takes little more time by the method of measurement the increased value of this variable above the basal recording suggests that the process of baroreflex correction has already begun. This correction continues through the first few minutes and the normal mechanism of BP restoration to normal should be achieved by 5 minutes. Therefore, from the second minute recording of BP, higher SBP value suggests a higher sympathetic response present at that moment when compared to immediate value inferring the on going process of correction that has led to the increase in cardiac output to ensure proper tissue perfusion by shifting the sympathovagal balance towards more pronounced sympathetic activity. The second minute DBP shows a fall in its value when compared to the immediate value, which was recordable beyond the onset of baroreflex correction beginning, suggests that the return of enhanced sympathetic activity back to normal has begun ie, by two minutes the baroreceptor correction has been effectuated and rectification to baseline has already been initiated. The fifth minute recording shows a return of both SBP and DBP near to basal value in the controls which differed significantly from the study population suggesting the persistence of sympathetic lingering in their BP correction even by 5 minutes. This observation suggests that the children of hypertensive parents, though normotensives had persistence of sympathetic activity that has blunted the baroreflex mechanism of BP corrrection within normal duration of response activity. Similar impaired baroreflex response among the normotensive offspring of hypertensive parents was observed by Iwase et al. (1984), Takata S et al.(1985), OOkuwa H et al.(1987) and Premraja R and Chandra S(2015).[13-16] The parasympathetic test revealed a significant difference between the groups with 30:15 ratio [(R-R interval at beat 30)/(R-R interval at beat 15)] These inferences could suggest that there might be vagal attenuation but taking into consideration of the younger age of the volunteers, parasympathetic attenuation could be less probable than sympathetic overactivity overwhelming vagal control. Similar finding was reported by Premraja R and Chandra(2015) while Rathi P et al.(2013) found no significant difference between the groups.[16,7]

Thus from the above discussion of our findings it could be inferred that the normotensive offspring of hypertensive parents develop sympathovagal imbalance as a genetic mechanism of development with slow transition to hypertensive states and such similar findings are further supported by studies on spectral analysis of heart rate variability that confirm the existence of sympathovagal imbalance among normotensive offspring of hypertensive parents.[17,18]

CONCLUSION

In conclusion, this study shows that autonomic functions are disturbed in normotensive subjects with family history of hypertension. Since the subjects are young, the autonomic imbalance in them suggests their tendency for developing hypertension at an early age. Therefore, in such individuals the regular monitoring of autonomic activity can help to institute early interventions that aim at decreasing the sympathetic drive and enhance parasympathetic activity thus preventing the onset of hypertension and improving the quality of life. Early detection of altered autonomic states can help achieve

the goal of prevention by simple measures of lifestyle modifications that includes changes in diet pattern ,physical activity and by simple breathing exercises.

Conflict of Interest – NIL

Source of Funding- ICMR

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Association between Serum Total Testosterone and Obesity in Healthy Adults

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ABSTRACT

Background: Obesity has been associated with various endocrine abnormalities, both in men and women. It is well known that plasma testosterone levels in the obese decline with increasing body weight, particularly in men with central obesity.

Method: The present study was performed on 90 male subjects. Anthropometric measurements such as height, weight, hip circumference (HC) and waist circumference (WC) of each subject were recorded.Their waist hip ratio (WHR) and body mass index (BMI) were also calculated. The subjects were then divided into two groups based on BMI and waist hip ratio (WHR);the groups were further subdivided into two sub-categories.3 ml of venous blood was collected in the morningin a plain vial and allowed to clot and then centrifuged to separate the serum. Total testosterone was measured using enzyme-linked immunosorbent assay (*ELISA*).

Results: The study revealed decreased serum total testosterone in obese individuals when they were compared with normal weight individuals. Statistically significant differences were observed in the mean values of BMI ($p< 0.0001$) and WHR ($p= 0.0399$) for the testosterone. Significant inverse correlations of serum total testosterone with BMI($r = - 0.289$, $p =0.0058$) and WHR ($r = - 0.252$, $p = 0.0165$) were recorded in the study.

Conclusion: Adults whoare obese have low level of serum total testosterone than normal weightadults.

Keywords: *Serum Total Testosterone, BMI, Waist Hip Ratio.*

INTRODUCTION

With the advancement of life in the developing countries there is a visible change noticed in the life style of people such as lack of physical activity and increased junk food intake. Over the last two to three decades, this change resulted in increased risk of overweight and obesity.[1]

In men, testosterone plays a key role in the development of male reproductive tissues such as testis and prostate.It also promotes secondary sexual characteristics e.g. increased muscle and bone mass and hair growth, in males. In addition, testosterone is essential for health and well-being as well as preventing osteoporosis.[2]

Obesity has been associated with various endocrine abnormalities, bothin men and women. It is well known that the plasma testosterone levels in obese decline with increasing body weight, particularly in men with central obesity.[3]

The probable mechanism by which low testosterone also results in obesity is due to the alteration ofproteins and fat metabolism by testosterone. Under physiological conditions, testosterone is associated with significant rise in muscle mass providing maximal voluntary strength and decreased fatmass.[4] It decreases fat mass by mechanisms acting atdifferent steps in fat metabolism such as inhibiting the activity of lipoprotein lipase,[5] and inhibitingthe activity of glyceraldehyde 3-phosphatedehydrogenase.[6] Besides

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this, dihydrotestosterone (DHT) specifically causes decreased lipid accumulation and enhanced lipolysis in fat cell precursors.[7] Moreover, testosterone and DHT modulate the mesenchymal stem cell differentiation in a way that adipocytes differentiation is inhibited and shifted towards the formation of myogenic cells.[8]

A new research has demonstrated the role of macrophages in obesity. Adipose tissue and tissue macrophages produce adipokines and cytokines respectively (Figure 1). Adipokines include several novel andhighly metabolic active molecules such as leptin, resistin, adiponectin, visfatin and others. Macrophages that infiltrate fat tissues release cytokines such as tumor necrosis factor-α, interleukins 6 and 1 (IL-6 and IL-1). The imbalances among adipokines and cytokines levels are responsible for the obesity-relateddisorders including hypertension, diabetes, atherosclerosis, insulin resistance and also non-alcoholicfatty liver disease.[9-11]

Therefore, this study was planned to establish the association between obesity and serum total testosterone.

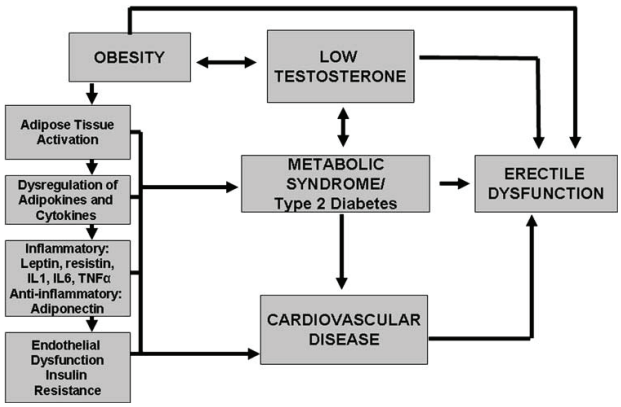

Figure 1 Diagram showing the inter-relationships of obesity, metabolic syndrome, serum testosterone concentration and erectile dysfunction (ED).[11]

MATERIAL AND METHOD

The present study was performed on 90 males (aged 20-50 years) M.B.B.S. students & employees of SGRRIM & HS, Dehradun, Uttarakhand. The subjects were briefed about the study and their consent was taken.

Subjects with the history of chronic disease, endocrinopathy or subjects taking any serum testosterone altering medicine (exogenous testosterone or anabolic steroids) alcoholics and smokers were excluded from the study.

The present study was done with the aim to establish the association between serum total testosterone and obesity.

Anthropometric measurements such as height, weight and waist circumference (WC), hip circumference (HC) of each subject were recorded. Further, body mass index (BMI) and waist hip ratio (WHR) were calculated.The subjects were then divided into two groups based on BMI and waist hip ratio (WHR); the groups were further subdivided into two sub-categories.

Groups Based on BMI Cut off Points

• Group A- consisted of 54subjects with their BMI <25 kg/m2

• Group B- consisted of 36 subjects with their BMI>25 kg/m2

Groups based on Waist-Hip Ratio (WHR) cut off points:

• Group C- consisted of 38 subjects with their WHR < 0.90.

• Group C- consisted of 52 subjects with their WHR ≥ 0.90.

ANTHROPOMETRIC MEASUREMENTS

1. Weight-It was measured in kilograms (kg) to the nearest 0.5 kg on a portable weighing scale with the subject in light clothing and without shoes.

2. Height-It was measured in centimeters (cm) to the nearest 0.1 cm with the subject standing straight against the vertical wall with no shoes, heels together and heels buttocks, shoulders, and head touching the vertical wall surface.

3. BMI-It was calculated using the formula:

Weight (kg)/Height (m2)

4. Waist Circumference (WC) - was measured in centimeters (cm) to the nearest 0.1 cm, at the level of umbilicus, at the end of expiration with person breathing silently, using a flexible plastic tape.

5. Hip Circumference (HC) - was measured in centimeters (cm) to the nearest 0.1 cm at the level of greater trochanter, using a flexible plastic tape.

6. Waist-Hip Ratio (WHR) - was calculated using

the formula:

Waist Circumference/ Hip Circumference

SERUM TESTOSTERONE LEVEL

Collection of blood sample- 3 ml of venous blood was collected in the morning between 8-11am at the department of Physiology, SGRRIM & HS, Dehradun, in a plain vial and allowed to clot and then centrifuged to separate the serum.

Total testosterone was measured using enzyme-linked immunosorbent assay (*ELISA*).

METHOD OF SERUM TOTAL TESTOSTERONE ESTIMATION:

The DRG testosterone ELISA kits from Centena Biomed Laboratories (Lucknow) were used for the quantitative in vitro diagnostic measurement of testosterone in serum.

PRINCIPLE OF THE TEST

The DRG Testosterone ELISA kit is a solid phase enzyme-linked immunosorbent assay (*ELISA*), based on the principle of competitive binding. The micro titer wells are coated with a monoclonal (mouse) antibody directed towards a unique antigenic site on the testosterone molecule. Endogenous testosterone of a patient sample competes with a testosterone horse-radish peroxidase conjugate for binding to the coated antibody, after incubation the unbound conjugate is washed off. The amount of bound peroxidase conjugate is reverse proportional to the concentration of testosterone in the sample. After addition of the substrate solution, the intensity of color developed is reverse proportional to the concentration of testosterone in the patient sample.

CUT-OFF VALUES

The World Health Organization reference values were adopted for classification of obesity.[12]Abdominal obesitywas defined as having a WC approximately90th percentile for age andgender.[13]The reference values of testosterone in males were 5thpercentile (2.0ng/ml) and 95th percentile (6.9ng/ml).

STATISTICAL ANALYSIS

Descriptive statistics including mean, standard deviation, range and frequency were computed for all the variables including age, testosterone, BMI, waist-hip ratio (WHR). Independent sample t-test was used tocompare the means of all variables for significanceof difference. Pearson correlation was applied to determine correlation and its strength betweentestosterone and BMI along with WHR. Thresholdfor statistical significance was set at $p < 0.05$.

OBSERVATION& RESULT

Table-1: Descriptive Statistics of 90 healthy male subjects.

Variables	Means +S.D.	Range
Age (Years)	25.46 +8.81	20-50
Height (cm)	170.41+ 6.55	155-185
Weight (kg)	62.01+8.67	45-94
BMI(kg/m2)	24.63+ 3.57	19-33
WC(cm)	83.27+8.70	65-107
HC (cm)	92.1+ 6.33	78-106
WHR	0.90+ o.06	0.78-1.04
TT (ng/ml)	4.685 + 1.87	1.94 - 8.56

Table-1 shows descriptive statistics of 90healthy subjects aged between 20 to 50 years in terms of Mean(±SD) and valuerange from minimum to maximum.

Table-2: Association of BMI and WHR with serum Total Testosterone.

Variables	subgroups	TT (ng/ml)	P value
BMI	BMI <25 n = 54	5.37 ± 1	< 0.0001***
	BMI >25 n = 36	3.12 ± 1.78	
WHR	WHR < 0.9 n = 38	5.12 ± 1.49	= 0.0399*
	WHR>0.9 n = 52	4.30 ± 2.06	

Notes:Data are presented as the mean ± standard deviation. *P<0.05, statistically significant,**P<0.01, highly significant,***P<0.001, extremelysignificant.

Mean compared between the groups based on BMI and WHR for total testosterone was analyzed by applying independent samples t-test and statistically significant differences were observed in them, as shown in Table-2.

Table-3: Correlation of Testosterone with BMI and Waist-Hip Ratio.

Variables	Correlation Coefficient	P value
BMI	-0.289	0.0058**
WC	-0.160	0.1305
HC	-0.012	0.9084
WHR	-0.252	0.0165*

*p<0.05, **p<0.01, ***p<0.001

Table-3: Shows the strength of the linear relationshipbetween total testosterone and BMI, WC, HC& WHR when Pearson correlation was applied. All variables i.e.BMI, WC, HC & WHR were negatively correlated with total testosterone. The correlations of BMI and WHR with total testosterone were statistically significant (p <0.05); while correlations of WC and HC with total testosterone were statistically non-significant (p >0.05).

DISCUSSION

Obesity is broadly documented as an essential public health problem; its prevalence has increased significantly in the recent decades. BMI and waisthip ratio measurements are one of the importanttools to assess obesity and are mostly used instudies evaluating the relationship between total testosterone and obesity.

Low testosterone levels along with the proven effects on male secondary sexual characteristics also increase body mass index[14] which is primarily due tooverweight and obesity. Obesity is the root causeof many systemic illnesses like diabetes mellitusand cardiovascular diseases and is directly associated with low total testosterone levels.[15]Androgen deficiency in males (mainly totaltestosterone) has been investigated in several parts of the world in recent years.

The present study evaluated the association of obesity with serum total testosterone in adults. The main findings of the study were that obese individuals have statistically significantlow levels of serum total testosterone.

Mean comparison of two sub-groups of BMI for testosterone showed statistically significant mean difference in the testosterone values (p <0.0001).This finding was similar to observation reported by Goel et al and Heald et al in their studies.[16-17]

Mean comparison of two sub-groups of WHR for testosterone also showed statistically significant mean difference in the testosterone values (p =0.0399). This finding was similar to observation reported by Hirani V et al and Gapstur SM et al in their studies.[18-19]

The reason of decline in the level of testosterone in obesity may be because an accumulating body of evidence suggests that visceral fat produces various pro-inflammatory factors, such as: cytokines, which inhibit testosterone synthesis in the testes by the direct blockage of enzyme acting in the testosterone production pathways.[20-22] Other recent studies have alsodemonstrated that dyslipidemia, diabetes and obesity can be associated with the alterations in sex steroid hormone concentrations.[23]

We found statistically significant negative correlation of TT with BMI (p= 0.0058) and WHR (p= 0.0165) while statistically non-significant negative correlation with WC (p=0.1305) and HC (p=0.9084) in the obese participants. Osuna's findings were also similar, which showed significant negative correlation of TT with BMI and WHR.[24,18] Therefore we believe that these inverse correlations between TT, BMI and WHR are responsible for the modulation of the lean body mass, fat mass and body composition due to low TT.

CONCLUSION

Conclusively, obesity is associated with low serum total testosterone. Both parameters i.e. BMI and WHR were associated with significantly low testosterone and they also have asignificant negative correlation with serum total testosterone.

Source of Funding: Personal funds

Conflict of Interest: None

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

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Study of Relationship between Body Mass Index and Audiovisual Reaction Time in Adolescent Females

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ABSTRACT

Objectives: Reaction time is an indirect index of processing capabilities of the central nervous system. The present study was carried out to determine if there is any effect of body mass index on reaction time in adolescent females.

Material and method: 90 adolescent females between 17-19 years of age with similar socioeconomic status were selected from 1st and 2nd year MBBS students for the study. The height and weight were recorded and the BMI was calculated. The subjects were divided into 3 groups based on their BMI: those having normal weight, underweight, and overweight according to the WHO criteria. The Auditory and Visual reaction time were measured by indigenously prepared reaction time software.

Results: Visual as well as auditory reaction time was prolonged in subjects having higher and lower BMI than normal. Visual reaction time was significantly longer in subjects with lower BMI as well as those having higher BMI as compared to subjects with normal BMI ($P<0.05$).

Conclusion: The study showed that the BMI of an individual affect the audiovisual reaction time, which is an indirect measure of the sensory motor association.

Keywords: *reaction time, body mass index, auditory, visual*

INTRODUCTION

The reaction time is the time interval between the stimulus application and the appropriate voluntary response as rapidly as possible[1]. It involves stimulus processing, decision making and response programming. Various neurophysiological studies suggest a relationship of BMI with the cognition, attention and the memory[2,3]. Several simple situations of reaction time are usual in our day to day life e.g. response to a door bell, telephone ring or whistle of pressure cooker. Reaction time provides an indirect index of the integrity and processing ability of the central nervous system[4]. It is a simple, noninvasive means of determining sensorimotor coordination and performance of an individual[5].

The effect of Body Mass Index (BMI) on reaction time has not been studied extensively to establish any correlation in between the two, however, BMI is likely to influence reaction time. BMI is an index of weight adjusted for stature which is body weight (in kilograms) divided by the square of the height (in meters). It is a convenient, easy to measure and useful tool for diagnosing obesity or malnutrition and related health risks. The acceptable range of BMI is from 18.5 to 25. BMI values above 25 are considered abnormal. Individuals with BMI values 25-30 are overweight, and those with values more than 30 are obese[6].

This study was done to assess whether BMI is associated with any alteration of auditory & visual reaction time in adolescent females within age group of 17–19 years.

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MATERIALS AND METHOD

The study was conducted in the Upgraded Department of Physiology, Sawai Man Singh Medical College, Jaipur with prior approval from Ethical committee for research on human subjects of the Institute. 90 female volunteers between 17-19 years of age with similar socioeconomic status were selected from 1st and 2nd year MBBS students for the study.

The purpose, procedure and noninvasive nature of the study were explained and written informed consent for the study was taken from each subject. Height (meters) and weight (kg) of each subject were noted. Height of the subject was measured using a measuring scale whose least count is 0.5 cm was converted in unit of meters. Weight was measured using weighing machine whose least count was 0.5 kg. BMI of each subject was calculated using Quetelet's index: BMI = Weight (kg)/Height^2 (m). The subjects were divided into 3 groups based on their BMI:

Group I : BMI = 18.5–24.99, normal weight;

Group II : BMI < 18.5, underweight;

Group III : BMI ≥ 25, overweight.

Females with history of any acute/chronic disease/ infection, physical/mental illness, hearing or visual disorder were excluded from the study. All the subjects were asked to have adequate sleep at night and to refrain from any medications throughout the study period.

The study was done during the Post menstrual phase of the menstrual cycle to avoid any alteration in their values due to menstrual phase[5]. The recordings were conducted at the same time of the day in the morning, about 2 hours after a light breakfast.

Visual Reaction Time and Auditory Reaction Time were measured by indigenously prepared Reaction Time Software. The visual stimulus consists of Colored Square that flashes in the center of the screen. The auditory stimulus consists of a computer generated beep of 3000 Hz / 200 msec, presented via a headphone to both ears. The frequency and duration of the stimulus were kept constant over sequential trials but the duration between two beeps varied randomly in order to prevent bias prior anticipation.

All the subjects were subjected to ART and VRT recording in a quiet room in the Department of Physiology, SMS Medical College, Jaipur. The subjects were asked to sit in front of the computer screen and to put the index finger of their dominant hand lightly on the "Enter" button of the keyboard of the computer. They were asked to press the "Enter" button as quickly as possible when a visual or auditory stimulus was presented to them. Three consecutive readings of each stimulus were recorded. The lowest reading was taken as reaction time.

Statistical analysis: All results were expressed in Mean±S.D and data was analyzed using oneway ANOVA with post-hoc Tukey's HSD test, 'P'<0.05 was taken as cut off for the measure of significance.

RESULTS

In the present study Body Mass Index was significantly different among the three study groups (Table 1).

There was prolongation of ART in underweight as well as overweight subjects when compared to normal subjects and the result was statistically not significant (Table 2).

Prolongation of VRT was seen in underweight as well as overweight subjects and the result was statistically significant when compared to normal subjects (Table 2).

TABLE 1: Age & anthropometric parameters of the study subjects

Parameters	Group I (n=30)	Group II (n=30)	Group III (n=30)	P value
Age (years)	18.33±0.497	18.26±0.52	18.35± 1.01	P>0.05
Height (m)	153.3±3.23	156.37±3.13	1.54± 3.93	P>0.05
Weight (kg)	48.06±4.01	42.46 ± 3.24***	58.41± 3.92 ***	P<0.001
BMI(kg/m2)	20.39±1.15	16.56±1.44 ***	25.72 ± 1.72 ***	P<0.001

The * depicts comparison with group I (normal BMI).

P > 0.05 Not Significant

P < 0.001 Highly Significant

TABLE 2: Auditory reaction time & Visual reaction time of the study subjects

Parameters	Group I (n=30)	Group II (n=30)	Group III (n=30)	P
ART (msec)	181.36±14.69	198.48±13.03	189.33±11.32	0.548
VRT (msec)	209.11±5.71	247.64±11.39*	242.59±14.63*	0.012

The * depicts comparison with group I (normal BMI).

P > 0.05 Not Significant

P < 0.05 Significant

DISCUSSION

In this study, the visual reaction times were longer then auditory reaction time[7,8], because visual reaction time involved chemical changes in its occurrence. Also, the visual pathway involved many collateral pathways to various association areas and hence, a greater delay in the comprehension of the visual stimulus. In contrast, Shenvi et al., found that the auditory reaction time was greater than the visual reaction time and they rationalized that the auditory pathway must be more polysynaptic as compared to the visual pathway[9].

Reaction time measurement includes the latency in sensory neural code traversing peripheral and central pathways, perceptive and cognitive processing, a motor signal traversing both central and peripheral neuronal structures and finally the latency in the end effector activation i.e. muscle activation[10]. So any change in reaction time indicates presence of a peripheral and/ or central disturbance.

In this study, visual as well as auditory reaction times were longer in underweight subjects as compared to that of normal weight group, the difference being statistically significant only for visual reaction time.

Previous studies have shown the association between underweight and the cognitive functions was likely to be due to preclinical dementia[11]. A further possibility is that the underweight persons experience a dysregulation in the hormone secretion which corresponds to that in anorexia, which results in cognitive disorders[11].

In the present study, both ART and VRT were increased in the overweight individuals when they were compared to the values in the normal weight girls and this was statistically significant for the VRT.

Skurvydas A.et al showed longer reaction time in overweight young males[12]. There is evidence that overweight and obesity, indicated by body mass index has been found to be associated with a host of medical conditions, like cardiovascular, pulmonary, and endocrine diseases.

Gunstad J et al. showed the relationship between the elevated BMI values and the reduced cognitive performance and suggested that this relationship does not vary with age[13,14].

Different neurophysiological studies have shown influence of obesity and elevated body mass index on cognitive functions, memory deficits and executive dysfunction in young as well as middle aged individuals[3,12,13,14].

The vascular disease is likely to underlie the association between obesity and cognition, because obesity is a risk factor for the vascular disease, which, in turn, is related to a higher risk of the cognitive impairment. Another possible mechanism is secretion of hormones, cytokines, and growth factors from adipose tissue affecting brain health[11].

CONCLUSION

This study suggested that both obesity and underweight affect cognitive performance in the early midlife.

In present study, VRT was significantly higher in both overweight and underweight individuals than the normal individuals. As the association of ART was not

found to be statistically significant, further study needs to be done on large sample size to arrive at conclusive inference.

Conflict of Interest: None

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Study of Electrocardiographic QT and QTc Changes in Apparently Healthy Obese Young Women

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ABSTRACT

Background: Obesity is well recognised as an epidemic in both developed and developing countries. Obesity exhibits a wide variety of electrocardiogram (ECG) abnormalities in adults, which often lead to cardiovascular events. The present study aimed to evaluate the ECG intervals, especially QT and QTc in obese young medical undergraduates. **Method**: A cross sectional study was conducted among 60 apparently healthy young medical undergraduates between age group of 18 to 23 years, who were further divided into two groups according to their BMI. The first group consisted of non-obese subjects with BMI of 18 to 24.9 kg/m^2 and the second group consisted of obese subjects with BMI of 30 kg/m^2 and above. All the subjects underwent investigation for lipid profile and electrocardiogram analysis. **Results**: After analysing the data and comparing by independent sample t-test, we found significant ($p<0.001$) prolongation of QT and QTc interval in obese group along with significantly high serum total cholesterol, low density lipoproteins (LDLc) and triglycerides (TG) in comparison to non-obese group ($P<0.001$). **Conclusion**: The ECG analysis of obese young women indicated prolonged QT and QTc intervals, which in turn predisposes them to risk of early onset of ventricular arrhythmias.

Keywords: *QT interval, QTc interval, Obesity, BMI, young women*

INTRODUCTION

Obesity is a chronic medical condition characterized by an excessive accumulation of fat on human body that causes a generalized increase in body mass[1]. It is measured by using body mass index (BMI) which reflects weight and height of an individual. BMI is calculated as the weight in kilograms divided by the square of the height in meters [BMI = weight(kg)/ height(m^2)]. The World Health Organization (WHO) classified obesity as follows. BMI of 18 - 24.9 kg/m^2 is considered normal weight, a BMI of 25.0-29.9 kg/m^2 is considered overweight and a BMI of 30 kg/m^2 or higher is considered obesity[2]. Obesity causing disturbances in lipid profile is established[3]. Both obesity and serum lipid profile are modifiable factors for cardiovascular diseases[4]. A serum cholesterol level greater than 200mg/dl or fasting triglycerides more than 150 mg/dl is associated with increased incidence of coronary artery disease[4]. Obesity is established as one of the prime risk factor for myocardial infarction[5]. The changes in cardiac morphology such as LV hypertrophy and right ventricular hypertrophy are induced by obesity[5]. However along with the changes in cardiac anatomy, obesity may also alter the electrocardiogram (ECG)[5]. An electrocardiogram is a simple representation of the electrical activity of the heart muscle during the cardiac cycle. Recording of ECG is one of the easiest, cheap and reliable methods of assessing cardiovascular function. Electrocardiogram (ECG) abnormalities are associated with an increased risk of adverse cardiovascular outcomes, including high resting heart rate (HR), prolonged PR interval, QRS duration and QT interval and abnormal shift in

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electrocardiographic axis [5,6]. Prolonged PR interval has been associated with an increased risk of heart failure (HF), incident atrial fibrillation (AF) and mortality in the Framingham Heart Study [7]. Prolonged PR interval is also correlated with endothelial dysfunction and activation of vascular repair, which may be a cause for adverse cardiovascular outcomes [8]. Prolongation of QRS duration is a potential marker of cardiac structural and functional abnormalities, including left ventricular systolic dysfunction, that may predispose individuals to an increased risk of heart failure [9]. A Framingham follow-up study demonstrated that healthy individuals with prolonged QRS duration were at a higher risk of future pacemaker implantation [9]. Studies have indicated that prolongation of corrected QT (QTc) interval predicts the risk for sudden death in patients without evidence of cardiac dysfunction [10,11]. It has been observed that obesity induces changes in the normal ECG pattern, especially on duration of QT and QTc intervals in healthy young women but the results have been inconsistent [11,12]. Since there are very few studies on effect of obesity on ECG changes, this study was undertaken to investigate the duration of QT and QTc interval in apparently healthy obese young women in order to stratify them for risk of cardiovascular diseases.

METHODS AND MATERIALS

Sixty apparently healthy young female medical student volunteers, in the age group of 18-25 years, were enrolled for this study. The subjects were subsequently divided into two groups according to their BMI. The first group consisted of non-obese (normal body weight) subjects with BMI of 18 to 24.9 kg/m^2 and the second group consisted of obese subjects with BMI of >30 kg/m^2. Individuals leading a sedentary life style were included. Written informed consents were obtained from all the participants after explaining the study protocol. The present study was conducted in the department of Physiology, Gandhi Medical College, Hyderabad for a period of two years after obtaining the approval of institutional ethics committee. All the subjects underwent a thorough evaluation of medical history and general physical examination. The clinical details and baseline parameters were recorded on a well proforma prior to collection of 10 milliliters of blood from each of these subjects, for investigating the lipid profile. The laboratory was well ventilated throughout the ECG recordings. All the recordings were taken between 10 AM to 1 PM at room temperature.

METHOD

Waist to hip ratio (WHR):

The waist circumference (cm) was measured at a point midway between the lower rib and iliac crest, in a horizontal plane. The hip circumference was measured in centimeters at the widest girth of the hip. The measurements were recorded to the nearest 0.1 cm and were used to WHR.

BMI:

The weight was measured with the subjects wearing light clothing and barefoot on a SECA weighting scale (Hamburg, Germany). The standing height was measured without shoes with the subject's back to a vertical backboard. Both the heels were placed together, touching the base of the vertical board. Normal weight and obesity were defined on the basis of WHO cut offs. BMI was measured by calculating the weight in kilograms divided by the square of the height in meters (BMI = weight (kg)/height (m^2))^2.

Blood pressure:

The systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded by sphygmomanometer in the morning, prior to collection of blood sample.

Heart rate:

Recording of pulse was done by palpating the radial artery for full one minute .

ECG Recording:

ECG recording was carried out in all the subjects after thorough clinical and systemic examinations were done. With the subjects in the resting supine position, a 12 lead electrocardiogram was recorded by using a single channel ECG cardiant (heart view 1200 ECG recorder-manufactured by Brown Dove Healthcare Pvt Ltd) at a speed of 25mm/s. The RR and QT intervals are to be measured from seven cardiac cycles from a recording of lead II of the resting ECG. All ECGs were evaluated blindly. The QT interval was measured from the earliest onset of the QRS complex to the terminal portion of the T wave, where it met the baseline [12]. The RR interval from the preceding cardiac cycle is to be measured from the peaks of the R waves to correct the QT interval for

heart rate (QTc). The QT and the preceding RR intervals were measured manually from digital ECG signals. This data is to be used for calculating QTc interval using Bazett formula i.e QT interval/square root of the RR interval [13].

Lipid profile:

Serum total cholesterol (TC), triglycerides (TG), high-density lipoprotein (HDL), low density lipoprotein (LDL) were done by auto-analyser (Hitachi 912).

STATISTICAL ANALYSIS

The data was expressed as mean ± standard deviation. The results which were obtained were statistically analyzed by using the Student's 't' test by using SPSS software version 19. A "p"-value of <0.05 was taken as significant.

RESULTS

The baseline characteristics of study subjects are shown in Table -1. The lipd profile of obese and non-obese young women is compared in Table-2. The ECG analysis is described in Table-3. While comparing baseline variables, we did not find any significant difference in age and height, whereas significant difference ($p<0.001$) (table-1) was observed in WHR and BMI between the obese and non-obese subjects. While comparing the lipid profile, the obese group was observed to have significantly high serum total cholesterol, LDLc and TG ($p<0.05$) in comparison to non-obese young women. The ECG analysis of obese group showed longer QT and QTc duration ($P<0.05$) compared to non-obese young women. Although, PR interval duration was found longer in obese compared to non-obese women, it was not statistically significance (Table-3).

Table-1: Baseline parameters of the non-obese and obese group. [Data expressed as mean ± SD]

Parameters	Non-obese group (N=30)	Obese group (N=30)	p-value
Age(Yrs)	19.75 ± 0.74	19.66 ±0.61	NS
Height(m)	162.44 ± 5.13	162.53 ±4.97	NS
Weight(kg)	54.34 ± 6.08	71.66 ±8.14	<0.001
WHR	0.82 ± 0.07	0.90 ±0.06	<0.001
BMI(kg/m^2)	21.68 ±1.73	27.96 ± 2.63	<0.001

P Value >0.05-NS, *P Value<0.05-S ,**P Value <0.001-HS

Table-2: comparison between lipid profiles of the obese group and non-obese group. [Data expressed as mean ± SD]

	Non-obese (N=30)	Obese (N=30)	p-value
Total Cholesterol (mg %)	156.55±16	196.1±23.23	<0.001***
HDL (mg %)	44.07±4.18	42.48±4.16	NS
LDL (mg %)	113.1±15.7	126.49±17.95	0.0032*
TG (mg %)	115.04 ± 14. 17	163.45±18.91	<0.001***

P Value >0.05-NS, *P Value<0.05-S ,**P Value <0.001-HS

Table-3: Comparison of BP and ECG variables among obese and non-obese groups. [Data expressed as mean ± SD]

Parameters	Non-obese (N=30)	Obese (N=30)	p-value
SBP (mm of Hg)	110±14	132±18	<0.001***
DBP (mm of Hg)	78±4	80±8	NS
HR (beats/min)	76 ± 8	80±10	NS
PR(Sec)	0.14±0.024	0.15±0.036	NS
QT (Sec)	0.36±0.013	0.39±0.014	<0.001***
QTc (Sec)	0.36 ± 0.04	0.41 ± 0.039	<0.001***

P Value >0.05-NS, *P Value<0.05-S ,** P Value <0.001-HS

DISCUSSION

It is well known that obese subjects irrespective of gender are under the risk of ventricular arrhythmias and sudden death [14, 15]. However, the association between obesity and various ECG intervals such as QT interval has not been exactly clarified [15].The QT interval is an indirect measure of the duration of ventricular depolarisation and repolarisation [16] . The duration of QT interval varies between different leads and this range of intervals is referred to as QT dispersion [16]. A prolongation of the QT interval is associated with an increased rate of ventricular arrhythmias [17]. This in turn is due to left ventricular hypertrophy which may lead to electrical instability and ventricular arrhythmogenesis[17].

In our study, obese young women had higher systolic blood pressure, which is well estabilished [6,7,10,11]. We observed that in obese young women there is significant increase in SBP which may predispose them to hypertension. Also the ECG parameters such as QT and QTc intervals were significantly prolonged in comparison with non-obese women. The relationship between physiologic body mass index and QT interval confirms and extends previous reports showing a positive relationship between these variables in human obesity [11,12]. Vrtovec et al., evaluated the electrocardiogram of obese young women suffering from polycystic ovarian disease and found a significant linear association between degree of overweight and QTc [18]. The mechanisms underlying such a positive relationship between BMI and QT interval is not known although it is possible that an increase in cardiac output in subjects with higher body mass index might be responsible for the development of subclinical cardiac hypertrophy [19]. In obese patients, left ventricular enlargement and electrical instability may be caused by elevated plasma volume, ventricular diastolic dysfunction and enhanced neurohormonal activity [17]. The findings of the present study agree with that Moss AJ., indicating prolonged QTc interval and higher risk of cardiovascular diseases in obese young women [12].

CONCLUSION

The results of the current study indicate that in obese young women, the ECG analysis presented with prolonged QT and QTc intervals indicating increased duration of ventricular depolarisation and repolarisation. Thus, we conclude that QT and QTc intervals can be considered as electrical markers for screening of obese young women for the risk of cardiac arrhythmias . However, further studies are required to figure out the underlying mechanism of ECG changes in obese young women.

LIMITATIONS

The present study could not quantify the effect of different patterns of fat distribution on ECG changes in obesity. The sample size was relatively small, hence future studies with larger sample size is warranted to further strengthen our results.

Conflict of Interests: Nil

Source of Funding: Self

Ethical Clearance: The study was approved by ethics committee of Gandhi Medical College, Musheerabad, Hyderabad.

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Blood Pressure Variation During Different Stages of Normal Delivery

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ABSTRACT

Objectives: Present study was carried out to determine the variation of Blood Pressure (BP) during different stages of normal delivery and the effect of Oxytocin on BP to help in establishing better perinatal care towards achieving the goal of healthy mother and baby.

Materials and method: Hundred cases of normal delivery done at Nalanda Medical College Hospital, Patna were evaluated. BP was recorded at the time of admission, at onset of labour, after full dilatation of cervix, after delivery of baby, after oxytocin injection,and during puerperium.

Results: Baseline mean Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were 117± 5.56 and 77.92 ± 5.63 mmHg respectively. There was significant rise in SBP and DBP at onset of labour (122.76.±4.82 & 82.20± 4.82 mmHg respectively, $p < 0.05$). SBP and DBP falls significantly after Oxytocin injection (114.40±6.47 & 75.26±3.19 mmHg).

Conclusion: There is wide variation in BP during normal delivery and it falls significantly after Oxytocin injection. Close monitoring of BP during normal delivery may result in better perinatal outcome.

Keywords: *Normal Delivery, Diastolic Blood Pressure, Oxytocin, Systolic Blood Pressure, Variation.*

INTRODUCTION

Labor is a unique physiological situation involving major hemodynamic changes which could considerably impact blood pressure. In addition, blood pressure during labor could also be affected by the administration of certain agents such as epidural analgesia and oxytocin . Walter Radcliffe (1944) was the first person who had the honour to point out this interesting phenomenon. However, there are only a few relatively old studies that report normal values of BP during the first stage of labor [1-3]. Threshold value for abnormal blood pressure values during first stage of labor remains to be elicited.

Since all parturient women are at risk for PPH, care providers need to possess the knowledge and skills to practise active management of the third stage of labour to prevent PPH and to recognize, assess, and treat excessive blood loss.

Oxytocin is a 9-amino-acid peptide that is secreted in vivo by the posterior pituitary gland. It was first discovered in 1909 by Sir Henry Dale[4], and later synthesized in 1954 by du Vigneaud[5], and since then has been used for labour induction, augmentation and management of the third stage of labour. Regarding its mode of action, oxytocin binds to its receptors in the smooth muscles of the uterus to cause rhythmic contractions of the upper uterine segment, more powerfully towards the end of pregnancy, during labour and immediately postpartum. It is not bound to plasma proteins and has a short circulating half-life of about three to five minutes. Oxytocin is deactivated in the gastrointestinal tract and thus its main route of administration is parenteral.

The dose used for PPH-prophylaxis varies widely between practitioners and obstetric units, ranging from two to 10 IU (International Units) for both intravenous

bolus and intramuscular injections. For intravenous infusion, the usual prophylactic dose is 20 IU in 500mL of crystalloid solution, with the dosage rate adjusted according to response[6] .Oxytocin is recommended by the World Health Organisation as the drug of choice for the active management of the third stage of labour.

So the present study was carried out with an aim to determine the variation of BP in different stages of normal delivery and effect of Oxytocin on BP to help in establishing better perinatal care towards achieving the goal of healthy mother and baby.

MATERIALS AND METHOD

Hundred full term parturients (primigravidae and multigravidae) selected from different socioeconomic groups with absence of history of systemic disease, normal antepartum course, spontaneous labour with normal presentation and position at term with a live foetus, BP and haemocrit in normal range admitted for the management of labour in the Hospital for Woman, Nalanda Medical College & Hospital, Patna were included. Subjects with hypertension, diabetes mellitus, toxemia of pregnancy or taking medication which interfere with blood pressure were excluded.

The series included only cases where a normal delivery was followed by uneventful third stage of labour. All of them were having intravenous rehydration with 5% dextrose. The only drug that was given customarily in all cases was Oxytocin (10 IU I.M.) after delivery of baby. The deliveries are all spontaneous and blood loss during the course of the labour is minimal. The placenta from all the subjects separated spontaneously, and were delivered within minutes after delivery. Blood Pressure was recorded at the time of admission, at onset of labour , after full dilatation of cervix, after delivery of baby, after oxytocin injection, and during puerperium. Study was approved by Institutional Ethical committee and written informed consent was obtained from participants. All data were expressed as mean±standard deviation (S.D.). Statistical analyses was done using graph pad instat software. Statistical significance was accepted at $P<0.05$.

RESULT

Baseline mean Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were 117± 5.56 and 77.92 ± 5.63 mmHg respectively. There was significant rise in SBP and DBP at onset of labour (122.76.±4.82 & 82.20± 4.82 mmHg respectively, $p <0.05$). SBP and DBP falls significantly after Oxytocin injection (114.40±6.47 & 75.26±3.19 mmHg).

Table 1 Subject characteristics

Age(yrs)	24.04±5.279
Gravida	1.8±0.5997
Gestational weeks	39.18±0.8391
Hemodynamic variables BaselineSBP(mmHg) BaselineDBP (mmHg)	 117± 5.56 77.92± 5.63
Neonatal Weight(Kg)	2.34±0.523

All values are expressed as Mean ± SD

Table 2 Systolic Blood Pressure recordings of the Study Subjects (n=100)

SBP(mmHg)	Range	Mean	S.D.	S.E. of Mean	p value	Inference
On Admission	100 -130	117.52	5.56	0.787		
At the onset of labour	110 -130	122.76	4.82	0.681	<0.001	HS
After full dilatation of cervix	114 -130	123.76	3.95	0.559	<0.001	HS
After delivery of baby	100 -130	119.00	6.05	0.856	>0.05	NS
After oxytocin inection	96 -126	114.40	6.47	0.914	<0.001	HS
Taken in puerperium	110 -130	118.46	5.50	0.778	>0.05	NS

NB: HS - Significant at 0.1% or 1%.
S - Significant at 5% level.
NS - Not Significant.

Table 3 Diastolic Blood Pressure recordings of the Study Subjects (n=100)

DBP(mmHg)	Range	Mean	S.D.	S.E. of Mean	p value	Inference
On Admission	60 -86	77.92	5.63	0.796		
At the onset of labour	70 -90	82.20	4.80	0.679	<0.001	HS
After full dilatation of cervix	70 -90	82.32	5.27	0.746	<0.001	HS
After delivery of baby	60 -86	79.16	5.32	0.752	>0.05	NS
After Oxytocin injection	58 -84	75.24	4.98	0.704	<0.05	S
Taken in puerperium	64 -84	78.92	4.50	0.637	>0.05	NS

DISCUSSION

Various studies have agreed that the systolic and the diastolic pressures have shown a tendency to go up during the first and second stage of labour. This rise of blood pressure is more marked during the pains. In our present study significant rise in systolic blood pressure and diastolic blood pressure has been seen at the time of onset of labour, after full dilatation of cervix and during uterine contractions. (contractions increases the pressure upto 60 mm of Hg). Significant fall in systolic blood pressure and diastolic blood pressure during normal labour has been seen mostly after Oxytocin injection. Brown (1951) studied a group of 50 cases of normal labour and recorded variations of the maternal blood pressure.[7] Edwards[8] summarized that during labour both systolic and diastolic blood pressure rises, rise in blood pressure occur during uterine contractions and BP falls after delivery. Anjli Maroo[9] concluded that during labour and delivery hemodynamic fluctuation can be profound. Each uterine contraction displaces 300 to 600 ml of blood in to the general circulation. Stroke volume increases, with a resultant rise in cardiac output by an additional 50 % with each contraction. Thus it is possible for the cardiac output during labor and delivery to be 75 % above baseline. Mean arterial pressure also rise in part because of maternal pain and anxiety. Blood loss during delivery (300 to 400 ml for a vaginal delivery) can contribute to hemodynamic stress. Hemodynamic changes during the postpartum state are equally dramatic. During pregnancy, blood volume increases by 40 - 45 percent from non-pregnant levels. The increase is needed for extra blood flow to the uterus, the extra metabolic needs of fetus, and increased perfusion of others organs, especially the kidneys. Extra volume also compensates for maternal blood loss during delivery. During contractions, the cardiovascular system is subject to additional stress. The heart has to work harder to maintain organ perfusion. Positioning affects the demands placed on the cardiovascular system. If the laboring patient is positioned in the supine position, uterine contractions can cause a 25 percent increase in maternal cardiac output, and a resultant 33 percent increase in stroke volume. [10]However, when the laboring patient is in the lateral recumbent position, the hemodynamic parameters stabilize, with only a 7.6 percent increase in cardiac output and a 7.7 percent increase in stroke volume [10].These significant differences are attributable to partial occlusion of the inferior vena cava by the weight of the gravid uterus. Cardiac output is greatly influenced by the patient's position, especially during labor and delivery. Many women cannot tolerate the supine position, especially after 30 weeks' gestation. Supine hypotension syndrome can decrease cardiac output by 30 to 40 percent[11] .For safety, women are encouraged to maintain left uterine displacement either by elevation of the right hip or by positioning themselves on their sides. In this position, the uterus is not resting on the inferior vena cava, which may be compressed by an enlarged uterus decreasing blood flow back to the heart. With decreased blood flow to the heart, the heart rate often increases. As the placenta is delivered and the uterus contracts, there is an increased intravascular volume of approximately 500 ml [12].

The degree of blood loss depends on how quickly the placenta separates from the uterine wall and how well the uterine muscle contracts after delivery of the infant and the placenta. The best preventive strategy is active management of the third stage of labor [13]. Active management, which involves administering a uterotonic drug with or soon after the delivery of the anterior shoulder, controlled cord traction, and, usually, early cord clamping and cutting, decreases the risk of postpartum hemorrhage and shortens the third stage of labor with no significant increase in the risk of retained placenta[13] . In a series of 15 patients, Robson et al. have previously described a 9 mmHg increase in mean arterial blood pressure (from 82 to 91 mmHg)

when cervical dilatation reached 8 cm [3]. The authors attributed blood pressure increase to the effect of uterine contractions which cause an increase in both stroke volume and heart rate[3] . However, several confounding factors were not controlled in their study: half of the women received oxytocin and all received nitric oxide, the anti-hypertensive effect of which is well established [14]. Interestingly, a few teams have described a decrease in blood pressure after Oxytocin administration but in different clinical situations (high dose administration during cesarean section in prevention of postpartum hemorrhage)[15,16] . SBP and DBP values during labor are higher than those observed in the antepartum period. An SBP equal or higher than 150 mmHg or DBP equal or higher than 91 mmHg are associated with an increased risk of early postpartum preeclampsia[17] .

CONCLUSION

During normal labour, there is rise in systolic and diastolic blood pressure at the time of onset of labour, after full dilatation of cervix and during uterine contractions. (contractions increases the pressure upto 60 mm of Hg). After Oxytocin injection, systolic blood pressure and diastolic blood pressure falls significantly. So, close monitoring of BP during normal delivery especially in vulnerable subjects (cardiovascular disease etc.) is needed for achieving better perinatal outcome.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Taken

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Comparison of Autonomic Functions in Perimenopausal Women with Postmenopausal Women

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ABSTRACT

Background and Objectives: Menopause is a normal aging phenomenon, which is characterized by the depletion of functional ovarian follicles that are responsible for estradiol production. Hormonal deficiency affects many metabolic and physiological functions within the women's body including cardiovascular system. Postmenopausal women are at risk of developing cardiovascular complication associated with alterations in autonomic nerve functions. Thus, this study was aimed to compare any significant deviations in autonomic functions in postmenopausal women with perimenopausal women.

Materials and Method: Healthy perimenopausal and postmenopausal women with the age group of 45-55yrs were selected for the study. Parameters like Orthostasis, Mean Arithmetic Mean, Corrected QT Interval for sympathetic functions and valsalva ratio, expiration inspiration ratio, 30:15 ratio for parasympathetic functions are recorded. Serum estrogen was done for both the groups.

Results: By using student's t test, it was found that there was a significant increase in the sympathetic activity and reduced parasympathetic activity in postmenopausal women when compared to perimenopausal women. Sr.estrogen levels were also reduced in postmenopausal women. Parameters reflecting parasympathetic activity like valsalva ratio, 30:15 ratio, E:I ratio showed positive correlation with Sr.estrogen level in postmenopausal women.

Conclusion: There was a significant increase in the sympathetic activity and reduced parasympathetic activity in postmenopausal women due to decreased level of estrogen.

Keywords: *Postmenopausal women, Autonomic functions, Estrogen*

INTRODUCTION

One of the significant demographic changes noticed both in the developed and developing countries is the gradual increase in the ageing population.[1] A women in her reproductive period, gradually transcends into perimenopause and later after a couple of years into me nopause[2].Perimenopause includes the period beginning with the first clinical, biological and endocrinological features of the approaching menopause such as vasomotor symptoms, menstrual irregularities and ends 12 months after the final menstrual period.[3]It refers to the time period in the late reproductive years, usually late forty's to early fifty's. Menopause, a normal ageing phenomenon in women, consists of gradual transition from reproductive to the non-reproductive phase of life.[4] The term menopause refers to a point in time that follows one year after the cessation of menstruation.[5] The postmenopause describes those years following this point and this occurs between the age group of 45 and 60.

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Menopause is the most clear cut example of endocrinal senescence. It is a normal biological event and it signifies the depletion of functional ovarian follicles that are responsible for estradiol production. Hormonal deficiency affects many metabolic and physiological functions within the women's body including cardiovascular system.[6] There are also changes in functions of different organs of the body as well as the body autonomic nervous system responses with the advancement of age and menopausal duration. A large number of postmenopausal women in our country are at risk of developing postmenopausal complication including cardiovascular disease associated with autonomic nerve dysfunctions.[7] Alterations in autonomic nerve functions may occur in menopausal women and it commonly affects cardiac vagal control and usually associated with sympathetic over activity.[8]

Thus, this study was done to compare the autonomic functions in perimenopausal and postmenopausal women to assess any significant deviations in sympathetic and parasympathetic activity.

MATERIALS AND METHOD

This study was undertaken to compare the Autonomic functions in the perimenopausal and postmenopausal women. Case-control type of study was done. The study period extended from may 2011-2012. The subjects were selected from Thanjavur Medical College Hospital and Raja Mirasudar Hospital, Thanjavur. This study was performed on healthy women of age 45-55 yrs of perimenopausal and postmenopausal women. The nature of study was explained to all the subjects. Informed written consent was obtained from the subjects and the experimental protocol was approved by the Ethical committee.

Exclusion Criteria: Subjects with Diabetics, Hypertension, Cardiovascular disorders, Renal disorder, Liver disorder, smoking, Alcohol, Oral Pills, Hormone Replacement therapy were excluded. A detailed history was obtained. Clinical examination was done. For assessing the Autonomic functions ECG was recorded by a simple compact Electrocardiograph (Eden).

To assess sympathetic function Orthostasis, Mean arithmetic mean, Corrected QT interval was recorded. Valsalva maneuver, Expiratory : Inspiratory ratio, 30: 15 ratio for to asses parasympathetic function were recorded.

STATISTICAL ANALYSIS

Statistical analysis was done by using statistical package for social sciences (SPSS) XVIII version. The results were analysed by the student 't' test. Data's were expressed as mean with standard deviation. Oestrogen levels were determined in all the subjects by the method of electro-chemiluminescence immunoassay.

RESULTS

The results were analysed by the student 't' test. The statistical significance was considered at $P< 0.05$.

Table 1 shows mean, standard deviation, p value of sympathetic functions in study groups (postmenopausal women) and controls (perimenopausal). The higher values of mean for study groups shows increased sympathetic activity.

TABLE NO:1 Comparison of sympathetic functions

1	TESTS	MEAN	SD	Statistical inference
	ORTHOSTASIS			
	SBP Control (n=40)	103.05	7.961	T=-3.566 0.02<0.05 significant
	Study(n=40)	106.35	10.68	
	DBP Control (n=40)	61.95	4.356	T=1.716 0.09<0.05 significant
	Study(n=40)	71.75	5.006	
	VARIATION Control(n=40)	17.30	8.259	T=3.853 0.01<0.05 significant
	Study (n=40)	8.55	11.749	

Cont... **TABLE NO:1 Comparison of sympathetic functions**

2	**MAM SBP**			
	Control (n=40)	119.35	7.167	T=-2.414 .018<0.05 Significant
	Study (n=40)	123.15	6.912	
	MAM DBP			
	Control (n=40)	75.25	5.986	T=-2.414 .018<0.05 Significant
	Study (n=40)	78.75	4.043	
3	**QTC**			
	Control (n=40)	.3460	.07292	T=-3.361 .019<0.05 Significant
	Study (n=40)	.3631	.10093	

Table no:2 Comparison of Parasympathetic functions

Sl.no	Sample	Mean	S.D	Statistical inference
1	**Valsal Ra**			
	Control (n=40)	1.2233	.07301	T=6.439 .001<0.05 Significant
	Study (n=40)	1.0835	.11623	
2	**30:15 Ra**			
	Control (n=40)	1.0660	.07635	T=4.936 .001<0.05 Significant
	Study (n=40)	.9675	.10051	
3	E:I Ra			
	Control (n=40)	1.2270	.09487	T=6.610 .001<0.05 Significant
	Study (n=40)	1.0805	.10318	

Table 2. shows parasympathetic function that reveals lower values of mean in study groups when compared to control groups. It suggests that decreased parasympathetic activity in postmenopausal women which is statistically significant.

Table no: 3: Serum Estrogen levels in the study and the control groups

Sl.no	Estrogen Pg/dl	Mean	S.D	Statistical inference
1	Control (n=40)	94.3275	47.15459	T=4.629 .001<0.05 Significant
	Study (n=40)	46.0587	46.10235	

This table shows decreased estrogen level in postmenopausal women.

DISCUSSION

Menopause is a normal aging phenomenon in women. Perimenopause is a critical period in life during which striking endocrinological, somatic and psychological alterations occur in the transition to menopause. The perimenopausal period encompasses the change from the ovulatory cycle upto the cessation of mensus. In perimenopausal women, the Sr.estradiol levels do not decline until less than a year before menopause.

Menopause is the permanent cessation of mensus as a result of irreversible loss of a number of ovarian functions including ovulation and estrogen production. These women often suffer from various menopausal

complications including autonomic nerve dysfunction. The present study has shown significant alteration in the autonomic function tests, which includes sympathetic as well as the parasympathetic functions. In this study, Sr. estrogen levels of postmenopausal women showed significantly reduced values, when compared to the perimenopausal women.

Sympathetic function tests:

Orthostasis:

The present study showed significant fall in systolic BP after standing from lying position, which indicates sympathetic hyperactivity in postmenopausal women.

Latifa Afrin Dill Naher et al., and Anjali Nadir Bhat et al., also showed significant variation in orthostasis (SBP), which is similar to the present study.

Mental Arithmetic Mean:

The present study showed increased SBP and DBP of Mental Arithmetic Mean in the postmenopausal women, when compared to the perimenopausal women, which was found to be statistically significant. It reflects the increase in sympathetic activity.

Mi Kyong PARK et al., observed increased blood pressure of MAM in postmenopausal and perimenopausal women due to vasoconstriction caused by the sympathetic activation. The present study is congruent with this literature cited and also in accordance with the study done by Jason R.carter et al studied the sympathetic neural responses to mental stress in humans, which showed elevated mean arterial pressure.[9]

QTc Interval:

In the present study, the mean±SD of QTc interval showed significant variation in the postmenopausal women (0.363±0.1, p=0.01), which indicates the increased sympathetic activity.

ArDuino A.et al studied the relationship between age and QT interval. Their results showed prolongation of QT interval with advancing age. They explained it may be due to the changes observed in the heart and vasculature of the healthy elderly subjects. These include cardiac hypertrophy, increased vascular stiffness and aortic impedence. The cardiac hypertrophy is due to an increase in size of cardiac myocytes and is associated with a significant prolongation of the transmembrane action potential. The present study is also in accordance with the Reardon et al., [10]Taneja et al.,[11] V.pham et al.,[12]

Parasympathetic function tests:

Valsalva Ratio: In the present study , mean and SD of the Valsalva ratio showed reduced values, which is statistically significant (1.0835±0.11,p=0.01). Thus, it indicates the decreased parasympathetic activity.

G.V.Lathadevi et al., showed reduced values of valsalva ratio. These findings were in accordance with Naher LAD et al., [13]

Expiration:Inspiration Ratio:

The mean and SD of E:I ratio in postmenopausal women were found to be decreased, which reflects the reduced parasympathetic activity(1.0805±0.10,p=0.01).. Similar findings were observed in previous studies by Virtanen et al., [14]M.Zi et al.,[15] **30:15 Ratio:**

In this present study, the mean and SD of 30:15 ratio in the postmenopausal women showed significantly reduced values(0.9675±0.100, p=0.001). These findings were in accordance with Naher LAD et al., [53]

Estrogen:

In the present study, mean and SD of Sr.estrogen in postmenopausal women was significantly lowered when compared to perimenopausal women(46.05±46.102,p=0 .01). Latifa Afrin Dill Naher et al showed significantly reduced levels of estrogen in postmenopausal women. They also demonstrated the increased sympathetic activity and decreased parasympathetic activity in postmenopausal women, that was related to low estrogen level.

CONCLUSION

The present study shows significant alteration in the Autonomic functions of postmenopausal women with the perimenopausal women. The results obtained in the present study showed decreased parasympathetic activity and the sympathetic activity was increased in the postmenopausal women. Estrogen levels were reduced in the postmenopausal women, when compared to the perimenopausal women, which exerts the regulatory influence on Autonomic functions**.**

Conflict of Interests: None

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Perceived Stress and its Physiological and Biochemical Parameter Alteration in Hospital Nursing and Non Nursing Supportive Staff

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ABSTRACT

Background: Stress which is a physiological, psychological human response, the manner in which human body reacts to such conditions is exactly what stress is known as. Stress supposed to be known as the imbalance between perceived threats and coping capabilities of individuals.

Materials and Method: The present study aimed to understand the interplay among the lifestyle habits, body weight, physical activity, work stress among nursing professionals and non-nursing professionals. A study with 240 professionals (120 nursing staff, 120 non-nursing supportive staff) examined how these employees cope up with anxiety and uncertainty in the run-up to hectic working hours. Validated and scientifically accepted scale for perceived stress (PSS) was used, to examine stressful life events and its adverse effect on professional's health; different physiological and biochemical parameters were estimated using standard protocols. The final data analysis was done by using appropriate statistical analysis.

Results: The overall prevalence of stress found to be more statistically significant in both the groups in terms of their Age, BMI, and Blood Pressure ($P<0.05$). The stepwise analysis indicated that increased BMI, changes in Blood Pressure is closely associated with increased levels of perceived stress in nursing staff.

Conclusions: This study clearly highlights that nursing staffs are suffering from moderate level of perceived stress. The results of this study allow us to affirm that perceived stress level assessment can be used to find out the occupational related stress among professionals.

Keywords: *Stress, nursing staff, perceived stress, occupational stress*

INTRODUCTION

Stress is a person's response to a stressor such as an environmental condition or a stimulus. Stress typically describes a negative condition or a positive condition that can have an impact on a person's mental and physical well-being.

Hans Selye[1] was the first endocrinologist to coin the term, "stress". In 2011 famous neuroscientists Bruce McEwen and Jaap Koolhaas[2] have highlighted that stress is a condition arising due to imbalance between materialistic, environmental factors and individuals own controlling mechanism.

The extensive survey of literature suggest that most of the persons undergoing high stress level are also suffering from increased in the levels of cholesterol , elevated levels of lipid profile[3] and significant gain in the body weight. [4,5] .

It is believed that in modern days stress has created much havoc in individual's life, In this regard we came across several articles related to physiological and psychological models of stress, all these literature has highlighted the close association between stress illness and general adaptation syndrome [6,7]. Physical inactivity also contributes to other risk factor for many metabolic disorders including diabetes, hyper-lipidemia, obesity, and hypertension. Modern life style and change in food

habits has resulted in increase in the growth of heart diseases among the young professionals. [8,9,10]

We decided to take study on nursing staff because, a) The duration of duty is relatively more, b) They have more number of night duties disturbing regular sleep pattern, c) Female members may have additional family responsibility, d) They have more hours of exposure to patients. Stressors identified in intensive care nursing staff are several. The important one are working relationship of nurses and doctors and other health care staffs, communication and relationship with patient and relatives, urgency in responding to emergency, increased workload, lack of support and understaffing, inability to take rest.

However since there were limited systematic studies on this issue carried out, the actual situation is not known with reference to the hospitals in Mangalore, South India. Stress levels of nursing staff should be kept at lowest, for the best performance and desirable quality as far as the patient care is concerned. Therefore the present study aimed to understand the interplay among the lifestyle habits, body weight, physical activity, work stress among nursing professionals and non-nursing professionals.

MATERIALS AND METHOD

Selection of subjects: The subjects for the study were hospital nursing staff both males and females of age 20 years to 50 years. Individuals of same age, sex, education, income, who were not directly involved in the patient care, were taken as controls. The written informed consents were obtained from the subjects who were willing to participate in the study. Ethical clearance was obtained from the Institutional Human Ethical Committee before the commencement of the study. The study was carried out at K.S. Hegde Charitable Hospital. Deralakatte, Mangalore. The staffs with history of neurological or psychiatric disorders, hypertension, diabetes mellitus, and pregnancy were excluded from the study.

Experimental methods: 1. Personal and Physical Information Scale. 2. Perceived Stress Score Questionnaire[11, 12]

Sheldon Cohen perceived stress scale was used for evaluating the stress levels of the subjects. The PSS score was determined by reversing the scores for questions 4, 5, 7 and 8. On these the scores could change from: 0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0. The total score on the PSS could range from 0 to 40, which were grouped into 3 groups [13]. Low stress: Scores ranging from 0-13. Moderate stress: Scores ranging from 14-26. High perceived stress: Scores ranging from 27-40.

Physiological parameters:

Resting heart rate (RHR): Resting heart rate was measured as per the procedure mentioned by Xavier Jouven et.al. [14]. As per the procedure resting heart rate was clinically determined by measurement of the radial pulse during a 1-min recording, after a 5-min rest in supine position.

Basal blood pressure (BBP): Blood pressure was measured in supine posture by manual sphygmomanometer with adult cuff after the participants were seated and quiet for a minimum of 10 minutes. Two readings were taken at 5 minutes apart and the mean of two was taken as the basal blood pressure as described by Chanda Rajak. [15].

Body mass index (BMI): As per the WHO guidelines height was recorded using measuring tape fixed to the wall, with bare foot, hands hang freely by the side, heels together, scapula and buttocks in contact with the measuring wall and recorded to the nearest 0.05cm and weight was recorded using weighing scale, zeroed before taking weight, without shoes to the nearest 0.05kg. From these data BMI was calculated for each subject using the standard formula; weight/square height (kg/m^2).

Biochemical parameters:

Method of blood sample collection: After obtaining informed written consent, clinical history was obtained and general physical examination was carried out. After sitting for a minimum of 10 minutes, 5ml of blood sample was collected from the antecubital vein with aseptic precautions in plain red-topped vacationer tubes and grey topped fluoride tubes after 8-12 hrs fasting.Biochemical analysis was done in Clinical biochemistry Laboratory in K. S Hegde Medical College Hospital in Cobas C 311 Auto analyzer from Roche Hitachi, using kits from the same company.

Fasting plasma glucose by UV test with Hexokinase: Hexokinase catalyzes the phosphorylation

of glucose to glucose-6-phosphate (G-6-P) by ATP. The rate of NADPH formation during the reaction is directly proportional to glucose concentration and is measured photometrically at 340nm. Conversion factor: - mmol/L x 18.02 = mg/dL [16, 17]

High density lipoprotein cholesterol by homogenous enzymatic colorimetric method: In the presence of Magnesium ions, dextran sulphate selectively form water soluble complexes with LDL, VLDL and chylomicrons which are resistant to Polyethylene glycol (PEG) modified enzymes. The cholesterol concentration of HDL-C is determined enzymatically by cholesterol esterase and cholesterol oxidase coupled with PEG to the amino group. Cholesterol esters are broken down quantitatively into free cholesterol and fatty acids by cholesterol esterase. The colour intensity of the dye is directly proportional to the cholesterol concentration and is measured photometrically at 600nm. Conversion factor: - mmol/L x 38.66 = mg/dL. [18, 19].

Triglyceride concentrations by enzymatic colorimetric method: Lipoprotein lipase completely hydrolyzes triglycerides to form glycerol which is oxidized to dihydroxy acetone phosphate and hydrogen peroxide by Glycerol-3-Phosphate Oxidase. The colour intensity of the dye is directly proportional to the triglycerides concentration and is measured photo metrically at 505nm. Conversion factor: - mmol/L x 88.5 = mg/dL . [20]

Statistical analysis: Data was entered in Microsoft excel and was analyzed with SPSS 16 software. Descriptive characteristics and biochemical parameters was calculated as Mean $\pm$ SD. Categorical variables were calculated as percentage. Unpaired students't' test was used to compare the continuous variables. To test the association of different parameters for perceived stress, Chi-Square test was used. Karl Pearson (or similar non parametric) correlation between different parameters were calculated.

RESULTS

Table 1: Comparison of physiological and biochemical parameters between nursing and non nursing supportive staff by using Independent sample t-test

Parameters	Nursing	Non Nursing Supportive Staff	t value	p value
Age(Years)	34.44 ± 7.42	35.75±8.01	1.313	0.191
Duration(Years)	9.81± 6.42	10.48±6.75	0.794	0.428
Height(M)	1.58±0.06	1.59±0.07	1.048	0.296
Weight(KG)	62.01±8.86	62.56±8.62	0.487	0.626
BMI(Kg/M^2)	24.69±3.71	24.53±4.21	0.317	0.752
RHR(Beats/min.)	74.69±10.11	73.44±10.03	0.963	0.336
SBP(mm Hg)	123.18±14.34	124.18±14.01	0.546	0.585
DBP(mm Hg)	79.30±9.09	79.52±9.36	0.182	0.856
FBS(mg/dl)	94.23±5.58	94.28±5.38	0.071	0.944
TC(mg/dl)	195.21±41.52	198.03±42.01	0.524	0.601
HDL(mg/dl)	51.09±10.65	51.41±10.98	0.227	0.821
LDL(mg/dl)	134.01±25.66	136.84±28.21	0.814	0.417
TG(mg/dl)	91.84±41.88	89.65±44.77	0.392	0.696
VLDL(mg/dl)	19.56±9.48	19.95±10.48	0.304	0.762

The information presented in this table shows the general physiological and anthropometric characteristics of the selected subjects. All the subjects were belonged to same age and gender groups.

Table 2: Comparison of Perceived Stress Scale (PSS) between nursing and non nursing supportive staff

GROUP	PSS	T value	P value
NURSING STAFF	22.35 ± 3.51	0.519	0.604
NON NURSING SUPPORTIVE STAFF	20.58 ± 3.44		

The result clearly shows that nursing staff has more perceived stress levels compared to non-nursing staff. But the p value was 0.604 and which is >0.05. Hence statistical significance cannot be established among the two groups.

Table 3: Relationship between physiological and biochemical parameters among nursing and non nursing supportive staff

	Nursing staff		Non nursing supportive staff	
	Pearson correlation (r)	P value	Pearson correlation (r)	P value
Age (Years)	0.351	<0.001	0.210	0.021
BMI(Kg/M²)	0.412	<0.001	0.355	<0.001
RHR(Beats/min.)	-0.019	0.834	-0.199	0.030
SBP(mm Hg)	0.403	<0.001	0.369	<0.001
DBP(mm Hg)	0.480	<0.001	0.410	<0.001
FBS (mg/dl)	0.010	0.911	-0.067	0.470
TC (mg/dl)	0.143	0.118	0.066	0.474
HDL (mg/dl)	0.147	0.109	0.177	0.053
LDL(mg/dl)	0.087	0.343	0.034	0.713
TG(mg/dl)	-0.114	0.215	-0.085	0.356
VLDL(mg/dl)	0.044	0.635	0.085	0.357

The results presented in above table establish the correlation between different physiological, biochemical parameters with perceived stress. From the results it was clearly shown that, in nursing staff Age, BMI, SBP, DBP were linearly related with Perceived Stress Score (PSS). In non nursing supportive staff also BMI, SBP, DBP are linearly related with PSS.

DISCUSSION

In our study we have estimated the perceived stress among nursing and non nursing supportive staff. This analysis is important for hospital management and clinical psychologists. Interestingly our study reports that both the groups shows significantly similar stress level, in fact overall most of the subjects suffering from moderate stress. This can be attributed to their working hours, socio- economical conditions and life style.

The overall prevalence of stress found to be more statistically significant in both the groups in terms of their Age, BMI, and Blood Pressure. Studies done by other authors have reported higher prevalence of stress among nursing staff. [21]. We are the first to report that the correlation between the perceived stress and working hours , health condition , food habits and other factors influencing the individuals life style .

Our results are corroborating the findings of Matthews et.al. [22]. in which they have highlighted the need of assessment of BP changes for the estimation of psychological stress level and prognosis of hypertension.

We have found out that increased BMI is closely associated with increased levels of perceived stress. Our study results are in the line of earlier findings by Nishitani ,[23] in which they have found out that obesity

is directly related with increased stress levels among Japanese male workers. This study also postulates that uncertainty at job place may be one of the reason to cause stressful condition and this condition might be adversely affecting the eating behaviours among the Japanese male workers .It is very interesting to note that there is bidirectional effect of work stress on BMI among men [24].

Our results throws the light on general finding that overall perceived stress is directly related to working conditions at job place, but it is still remains ambiguous whether the overall increase in stress level are due to physiological, pathological and psychological factors, which have not been assessed in the present study (marital status, menopausal status, metabolic disorders, individuals reactivity to certain drugs, socio economic conditions).

Assessment of perceived stress level among nursing staff can be used as a tool to restructure and enhance the service conditions and work environment in hospitals. The findings of this study may be used as a guide for the policy makers and hospital management to design the appropriate stress-free environment in hospital campus and also for improving the better patient care.

CONCLUSION

The present study is a valuable contribution toward the substantiation of the four-factor model (Age, BMI, Lipid Profile, and Hypertension) within a professional working class for assessment of occupational related stress. This study clearly highlights that nursing staff are suffering from moderate level of perceived stress and interestingly perceived stress among all the subjects is significantly correlated with BMI and BP.

The results of this study allow us to affirm that perceived stress level assessment can be used to find out the occupational related stress among professionals. Eventually, this study suggests further investigations and use of a multi-factor assessment of perceived stress in professionals.

No conflicts.

Source of Funding: Self

Ethical Clearance: Ethical clearance was obtained from the Institutional Human Ethical Committee before the commencement of the study. The written informed consents were obtained from the subjects who were willing to participate in the study.

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A Study of Prevalence and Pathophysiology of Severe Anaemia in Pregnancy in a Tertiary Health Care Centre of Central India

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ABSTRACT

Background: Anaemia in pregnancy is considered in mild form as physiological process of pregnancy, but even in mild form it predispose the mother to complication because of drastic change in cardiovascular system and reduce immunity, thus if left undetected or untreated, it becomes a complicated affair to an extent of even causing threat to the life of patient. In India anaemia is the commonest haematological disorder occurring during pregnancy. Around 80% of pregnant women suffer from anaemia in India. It has been one of the major health problems not only for physician and obstetrician but also for the nation at large.

Aims & Objectives: To study the prevalence and pathophysiology of severe anaemia in pregnancy in a tertiary health care centre of central India.

Material & Method: This is hospital based observational cross sectional study of the pregnant females admitted in Department of Obstetrics & Gyanaecology, Bundelkhand Medical College & Hospital Sagar, M.P. Our study included 1477 cases from the period of 1st April 2016 to 31st March 2017.

Results: Total pregnant females admitted in the Department of Obstetrics & Gynaecology in BMC Sagar from 1st April 2016 to 31st March were 1477. Out of 1477 patients 179 (12.11%) have severe anaemia, and 23 (1.55%) have very severe anaemia.

Conclusion: So, from above study it can be concluded that severe anaemia is a major problem of pregnancy. The medical community especially Obstetrician, Nutritionist, Physiologist, Pathologist and Paediatrician should get actively involved to achieve the goal of safe motherhood which is the right of every women and a vision of new millennium.

Keywords: *Anaemia, Prevalence, Pathophysiology, Haematological disorder, Pregnancy*

INTRODUCTION

Anaemia in pregnancy is a very common problem in most of the developing countries. It is frequently severe and contributes significantly to maternal mortality and reproductive morbidity. The severity of anaemia is directly proportional to the increased numbers of complications in either mother or fetus. Even in this 21st century we are unable to prevent maternal deaths because of anaemia in India. Incidence of anaemia is more in the rural population since they are ignorant of haemopoietic diet and most of them belong to low socioeconomic group have poor nutrition, worm infestation, and frequent pregnancies at short intervals, bleeding piles and blood dyscrasia.

Anaemia is associated with almost all pregnancies especially in developing countries like India. Although anaemia was known since the days of Hippocrates (B.C.460) it was for the first time described by Walter Channing of Boston in America (1842), who reported 10 fatal cases of severe anaemia in pregnancy[1].

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WHO has estimated that prevalence of anaemia in developed and developing countries in pregnant women is 14 per cent in developed and 51 per cent in developing countries and 65-75 percent in India[2]. About one third of the global population (over 2 billion) is anaemic[3]. What is even more important is the fact that about half of the global maternal deaths due to anaemia occur in South Asian countries; India contributes to about 80 per cent of the maternal deaths due to anaemia in South Asia[4].

In view of studying & improving upon the current status of this commonest and most dangerous preventable condition of pregnancy, a study of prevalence and pathophysiology of severe anaemia in pregnant women was carried out in Department of Obstetrics & Gynaecology and Department of Physiology Bundelkhand Medical College, Sagar M.P.

AIMS AND OBJECTIVES

1. To analyses the prevalence of Severe Anaemia in pregnant women.

2. To study the pathophysiology of Severe Anaemia in pregnant women.

MATERIAL AND METHOD

Study design- This is hospital based prospective observational study of pregnant women admitted in Department of Obstetrics & Gynaecology, Bundelkhand Medical College, Sagar M.P.

Duration of Study – One year from 1st April 2016 to 31st March 2017.

Study Setting – Department of Obstetrics & Gynaecology and Department of Physiology, Bundelkhand Medical College, Sagar M.P.

Data Collection – Data was collected from patient's record book.

Data Analysis – After collection of data it was tabulated. Statistical calculation and subsequent analysis was made and has been presented in the form of tables.

RESULTS

Table 1: Prevelance of severe & very severe anaemia in this institutional study

Total No. of Pregnant Women Admitted	1477	100%
Severe Anaemia (Hb <7 gm/dl)	179	12.11%
Very Severe Anaemia (Hb <4 gm/dl)	23	1.55%

Table 2: Distribution of severe &very severe anaemic cases according to parity

S.No	Parity	Severe Anaemia Total = 179		Very Severe Anaemia Total = 23	
1	Primiparous	64	35.75 %	01	4.34 %
2	Multiparaous	102	56.98 %	16	69.56 %
3	Grand multiparaous	13	7.26 %	06	26.08

Table 3: Age wise distribution of severe anaemic cases

S.No.	Age Group	Cases	Percentage %
1	**<20 years**	7	3.91 %
2	**20-30 years**	143	79.88 %
3	**>30 years**	29	16.20 %
4	**TOTAL**	179	100 %

Table 4: Distribution of severe anaemic cases according to their habitat

S.No.	Habitat	Cases	Percentage %
1	**Rural**	112	62.56 %
2	**Urban**	67	37.44 %
3	**Total**	179	100 %

DISCUSSION

PATHOPHYSIOLOGY OF ANAEMIA IN PREGNANCY

The seriousness of this common medical disorder in pregnancy can be appreciated by the fact that it accounts for 10-40% of maternal deaths in India (Menon MK 1965) and hence become a major public health problem[5].

Definition: Anaemia is a clinical condition characterized by reduction in the number of RBCs less than 4 million/μL or their content of haemoglobin less than 12gm/dL or both. There are considerable variations in the definition of anaemia.

Anaemia is considered when Hb < 12 gm/dl or Haematocrit <37% in general population and <11 gm/dl in pregnant state. During pregnancy plasma volume expands more than RBCs volume resulting in haemodilution for this reason haemoglobin level below 11 gm/dl any time during pregnancy is considered anemia **(WHO-1993).** Anaemia when Hb <11gm/dl in 1st & 3rd trimester and <10.5 gm/dl in 2nd trimester **(CDC).**

Anaemia in pregnancy is again classified in different Grades by various authors-

1. By DC DUTTA - Classifying Mild Anaemia as Hb level of 8-10 gm/dL, Moderate Anaemia as 7-8 gm/dL and < 7gm/dL as Severe Anaemia.

2. By ICMR - Classifying Mild Anaemia as Hb level of 10.0-10.9 gm/dL, Moderate Anaemia as 7-10 gm/dL, Severe Anaemia as < 7gm/dL and <4 gm/dl as Very Severe Anaemia.

3. By WHO - Classifying Mild Anaemia as Hb level of 10.0-10.9 gm/dL, Moderate Anaemia as 7-9.9 gm/dL and < 7gm/dL as Severe Anaemia.

Aetiology:

There are various factors, which contribute towards anaemia in pregnancy. Some are prevalent before contraception and pregnancy aggravates others while some are peculiar to only pregnancy.

ICMR carried out a detailed study of 1810 Indian women and found mainly four factors for causation of anemia in pregnancy[6].

1. Dietary factors: The average Indian diet would appear to be adequate in iron content for non pregnant adult women; however various factors inhibit iron absorption of which phytate is most important. While absorption of 10% is essential to meet the iron requirement of a normal adult, studies using whole body counter indicates that only 3-5% of dietary iron is absorbed in an apparently normal healthy individual.

2. Iron store and Iron losses: Most of the population in Asian countries have poor iron store as indicated by poor bone marrow hemosiderin and low level of Liver iron

3. Demands of Pregnancy: The net iron loss in Indian women during pregnancy is around 350 mg. To meet this additional demand is posed. Demand during lactation contributes to reduce iron stores. With repeated, closely spaced pregnancies with prolong period of lactation, there is progressive depletion of iron stores with high incidence of anemia in women with high parities.

4. Infection and Infestation: Repeated and chronic infections prevent the utilization of iron and are additional contributory factors in causing anemia. Hookworm infestation in some areas aggravates the situation by increasing iron loss.

5. Others factors: In addition to above factors menorrhagia, chronic malaria, chronic blood loss due to piles and dysentery to be causative factors in iron deficiency anemia [6].

In pregnancy profound changes take place in maternal hematological system, which allow the system to adjust with newly formed maternal-fetal unit. These changes not only act in nutritive fashion but also have a protective role especially for the mother. The concentration of hemoglobin in the blood tends to be lower during pregnancy than at other times, because the plasma volume increases by about 50% on an average and the volume of circulating red blood cells by about 30%.

Maternal blood volume begins to increase early at 6th week and continues to rise by 45-50% till 34 weeks of gestation, returning to normal by 10-14 days postpartum[7, 8, 9, 10, 11]. This adaptive physiological hypervolemia helps to maintain blood pressure in presence of decreased vascular tone facilitates maternal and fetal exchange of respiratory gases, nutrients and metabolites and protects

the mother from hypotension, by reducing the risks associated with haemorrhage at delivery[12, 13].

Increased fetal and maternal production of estrogen and progesterone contribute to the rise in plasma volume[14]. Progesterone enhances Aldosterone production. Both Estrogen and Aldosterone increase plasma Renin activity, enhancing renal sodium absorption to 900 mEq and water retention to 8.5 L approximately, via the renin-angiotensin-aldosterone system[15]. The concentration of plasma adrenomedullin, a potent vasodilating peptide, rises during pregnancy, and correlates significantly with blood volume[16].

RBC volume rise to 30% above the pre-pregnancy volume at term[17]. Elevated erythropoietin concentration and the erythropoietin effects of progesterone, prolactin and placental lactogen result in an increase in RBC volume[18].

The pregnancy induced hypervolemia serves to meet the demand of the enlarged uterus with its greatly hypertrophied vascular system to protect the mother and fetus against the deleterious effect of impaired venous return in the supine and erect position and very importantly to safe guard the mother against the adverse effect of blood loss associated with parturition.

Severe Anaemia in Pregnancy:

Severe anaemia constitutes a major risk to gravid patient it would seem reasonable to expect that the disease dangerous to mother would also threaten the life and well being of the fetus. Severe anaemia is commonest cause of maternal and fetal morbidity and mortality.

Maternal Complication of Severe Anaemia (D.C.Dutta)-

During Pregnancy:

1. Preeclampsia
2. Inter current infection
3. Heart failure
4. Preterm labour

During Labour:

1. Uterine inertia
2. Post partum haemorrhage
3. Cardiac failure
4. Shock

During Puerperium:

1. Puerperal sepsis
2. Sub involution
3. Failing lactation
4. Puerperal venous thrombosis
5. Pulmonary embolism

Foetal Complication of Anaemia:

1. Low birth weight
2. Intra Uterine Growth Retardation (IUGR)
3. Intra uterine deaths & Still birth
4. Neonatal Infections
5. Congenital malformations
6. Neonatal Anaemia

Investigations undertaken to determine the factors responsible for the adverse maternal and perinatal outcome seen in association with anaemia indicated that anaemia per se might be responsible for some of the observed adverse effects[19, 20].

Prevalence of Severe Anaemia-

From our institutional study it is seen that the prevalence of severe anaemia is 12.11% and very severe anaemia is 1.55%.

U. Valvekar S. Viswanathan (2015) found prevalence of severe anemia in Pregnancy in a tertiary care rural hospital was 12.2%[21].

M. Shrivastav (1999) studied 178 cases of anaemia and observed the incidence of anaemia was 30.3% in booked and it was 78% in unbooked cases[22].

S. Rathee (1987) observed out of 3952 deliveries at medical college Rohtak, 170 (4.30%) were cases of severe anaemia[23].

Parity-

Multiparity is an important cause of severe anaemia. These patients have recurrent pregnancy and with each pregnancy the anaemia goes on increasing which is shown in our study by 56.98% of multipara, 35.75% of primi and 7.26% in grand multipara.

Habitat-

It is seen that 62.56% cases of severe anaemia in the study belong to rural area and 37.44 are from urban area.

CONCLUSION

So, from above study it can be concluded that anaemia still continues to be major health problem during pregnancy. Studies have shown that the adverse consequences of maternal anaemia may affect not only the neonate and infant but also increase the risk of non communicable diseases when the child grows into an adult and the risk of low birth weight in the next generation. To prevent anaemia in pregnancy, we have to uplift the socioeconomic and educational standards of our pregnant patients. We have to rectify the wrong and hazardous traditions and customs to provide better health care opportunities to rural patients. Technologies for detection of anaemia and its effective treatment are available and affordable and it is possible to effectively implement these even in primary health care settings and these are very cost effective interventions.

This emphasizes the need for continuing strengthening of our interventions on factors associated with Anaemia. Our aim should be to achieve "Healthy Mother with Healthy Baby and Healthy Nation".

Conflict of Interest- Nil

Source of Funding- Self

Ethical Clearance- Yes

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A Comparative Study Showing the Effect of Isotonic V/s Isometric Exercise on Ocular Perfusion Pressure in Healthy Young Adults

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ABSTRACT

Objective: To study and compare the effect of Isotonic and Isometric exercise on Ocular Perfusion Pressure (OPP) in healthy young adults.

Method: 40 healthy young adult volunteers comprising 20 males and 20 females in the age group of 18-21 years were selected among MBBS Phase I students of JSS Medical college, Mysuru. Isotonic exercise was performed using a treadmill, and isometric exercise was performed with a Digital back-leg lift dynamometer. IOP and BP were recorded before and after performing exercises using standard methods. Mean arterial pressure (MAP) and OPP were calculated. Statistical analysis was done using paired t test and ANOVA to test the difference between the groups.

Results: OPP increased by 11.27±1.33 mm Hg after isotonic exercise and by 6.82±0.02 mm Hg after isometric exercise. The changes were statistically significant (P< 0.001).

Conclusion: There was a significant increase in OPP after performing both Isotonic and isometric exercises. Moderate intensity Isotonic exercise proves to be beneficial for ocular health as it improves ocular perfusion.

Keywords: *Ocular perfusion pressure, Isotonic exercise, Isometric exercise, Glaucoma.*

INTRODUCTION

Several studies have magnified the vascular risk factors in the pathogenesis of glaucoma, among which, Intra-ocular pressure (IOP), blood pressure (BP) and ocular perfusion pressure (OPP) being the most studied. This vascular hypothesis is based on the premise that abnormal ocular perfusion and the subsequent ischemia of the Optic Nerve Head (ONH) play a major role in the development and progression of glaucoma.

The Perfusion pressure is the difference between arterial and venous BP. In the eye the venous pressure almost equals IOP. As such the OPP can be estimated as the difference between the arterial pressure and IOP.

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The required perfusion of the ocular tissues is ensured by an adequate OPP depending on a complex regulatory process that balances IOP and the BP. Hence dealing with the concept of OPP and BP at the same time may be more pertinent.

It has been proved that exercise leads to changes in a range of ocular parameters. Number of studies have shown a fall in IOP following different types and intensities of exercise[1,2] , and it has been concluded that all forms of physical exercise such as bicycling, walking and jogging reduces IOP[3,4].

In normal subjects, the IOP decreases during exercise proportional to the work load [5].

Physical activity has also been found to cause changes in selective ocular parameters such as ocular blood flow , tonic accommodation, pupil size, anterior chamber angle and retinal activity.[6]

Isometric exercise and dynamic exercise can both result in acute decreases in IOP.[3,7,8]

In India, studies related to OPP and exercise are sparse. Generally, these studies showed that isotonic exercise can increase OPP. For isometric exercise, the data are quite rare which are not conclusive and are more of conflicting.

Hence the present study was undertaken to study and compare the effect of Isotonic and Isometric exercise on OPP in healthy young adults.

MATERIALS AND METHOD

The Study was carried out in the Department of Physiology, JSS medical college, Mysuru. Ethical clearance was obtained from the JSS institutional ethical committee.

40 healthy young adults of age 18-21 yrs (20 males and 20 females) were randomly selected among MBBS phase-I students of JSS medical college as the study subjects. Subjects were screened using a questionnaire which included inclusion and exclusion criteria. Subjects with history of pre-existing refractive errors, glaucoma, migraine, any systemic illness, intake of any drug affecting IOP, Smokers and alcoholics were excluded. Subjects were informed about the purpose of the study, the study protocol and the informed consent was obtained and confidentiality of the data was maintained.

METHODOLOGY

Study was carried out in the research laboratory in Department of Physiology, JSSMC by the same examiner between 3 pm to 5 pm to minimize the bias of examiners and any diurnal variations of IOP. Subjects were instructed about the study before the experiment was done and asked to relax for 15 minutes in supine position. Resting BP was measured using Mercury Sphygmomanometer and IOP using Schiotz tonometer in supine position. Mean arterial pressure and OPP was calculated using the formula,

MAP = DBP+1/3 PP (PP=pulse pressure)

OPP = 2/3(MAP-IOP)

SOPP (Systolic Ocular Perfusion Pressure) = SBP – IOP

DOPP (Diastolic Ocular Perfusion Pressure) = DBP – IOP.

The two types of exercises were made to perform on two consecutive days separately but at a same time (3 pm to 5 pm) as to ensure a break of atleast 24 hrs after a type of exercise has been performed.

Isometric exercise: Using the Digital back-leg lift dynamometer, each subject performed three sustained isometric contractions to establish their maximum voluntary contraction (MVC). In this study, 40% MVC was held for 1.5-2.0 minutes and measurements for IOP and BP were recorded immediately (within 30 seconds), at five minutes, ten minutes and fifteen minutes after the exercise.

Isotonic exercise: Using Dynatrac treadmill subjects did exercise for 3minutes with a steady speed of 2.7 km/hour at grade 10%. This exercise load is equivalent to stage III of modified Bruce protocol and calculated equivalent METs is approximately 1.6-4. As per WHO classification of grading of exercise, this is categorised under moderate level of exercise. IOP, BP were recorded immediately and after 5, 10, 15 minutes after exercise. MAP and OPP were calculated.

STATISTICAL ANALYSIS

Mean and standard deviation were worked out to assess the estimate of various parameters under study. Paired t-test and ANOVA was applied to test the significance of changes in parameters studied. Microsoft Excel and SPSS version 19 software were used for data entry and statistical analyses respectively. P value < 0.05 was considered as significant.

RESULTS

There was no significant statistical difference between the two groups in terms of age and BMI.

At Rest: Resting mean values of MAP and MOPP among males was significantly higher ($p<0.05$) as compared to the female group (Fig. 1). Baseline SBP, DBP, IOP, SOPP and DOPP were also higher in the male group, but is statistically non-significant.

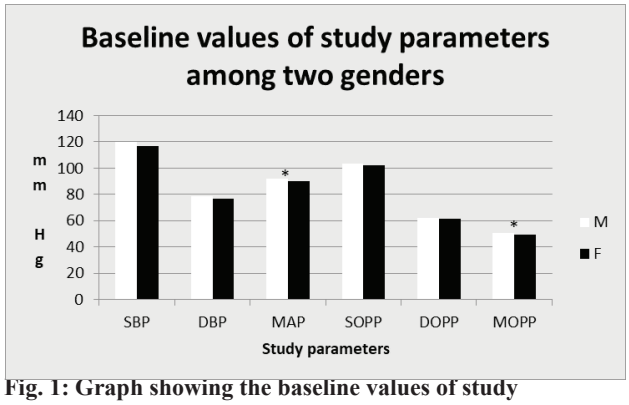

Fig. 1: Graph showing the baseline values of study parameters among two genders.

Note : * significant($p<0.05$)

After Isotonic exercise:

Immediately after Isotonic exercise, OPP was raised in both the groups significantly compared to the resting level. Mean increase was 11.31 mm Hg in male group where as in females it was 11.24 mm Hg.

After Isometric exercise:

Following Isometric exercise, OPP was raised in both the groups significantly compared to the resting level. Mean increase was 6.27 mm Hg in male group where as in females it was 7.44 mm Hg.

Table 1: Data showing the changes in study parameters after Isotonic and Isometric exercise

Parameter	At rest	After Isometric exercise	'p' value	After Isotonic exercise	'p' value
SBP (mm Hg)	118.10±3.68	127.85±3.02	0.000**	148.65±5.46	0.000**
DBP (mm Hg)	77.70±2.99	84.20 ± 2.78	0.000**	82.50±6.59	0.000**
MAP (mm Hg)	91.16±2.73	98.73±2.43	0.000**	104.55±4.24	0.000**
IOP (mm Hg)	16.24±1.03	13.56±1.53	0.000*	12.68±1.27	0.000*
SOPP (mm Hg)	101.87±3.22	114.29±2.66	0.000**	135.98±5.70	0.000**
DOPP (mm Hg)	61.47±2.44	70.64±2.51	0.000**	69.83±6.74	0.000**
MOPP (mm Hg)	49.96±1.41	56.78±1.39	0.000**	61.23±2.74	0.000**

Table 2: ANOVA summary showing significant difference between post-Isotonic and Isometric exercise OPP changes.

Source	SS	df	MS	F	p
Treatment between two groups	2578.07	2	1289.03	338.99	<0.0001

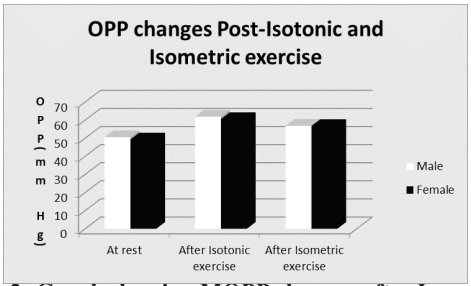

Fig.2: Graph showing MOPP changes after Isometric and Isotonic exercises

DISCUSSION

This study was conducted with the aim of determining the acute effect of both types of exercise i.e. Isotonic and Isometric exercise on OPP. Our data confirms the IOP lowering effect of exercise and thereby improving the OPP in a population of healthy young adults, which is consistent with previous studies.

Increase in serum lactic acid levels and a decrease in blood pH and also an increase in plasma osmolarity ,owing to increase in blood lactate, hemoconcentration and dehydration which associates the exercise, results in reduced secretion of the aqueous humor has been put forward as the possible explanation for IOP lowering effects of exercise.

Stewart RH observed a consistent fall in IOP after exercise and this fall could be due to fibrinolytic activity around schlemns cannel[9]. The out flow channels of eye especially around schlemns cannel show fibrinolytic acitivity,[10] such fibrinolysis was postulated to assist in preventing obstruction of the aqueous out flow path ways, and thus participates in the regulation of IOP. As exercise increases systemic fibrinolytic activity.[11] It can be assumed that exercise decreases IOP by increasing the facility of outflow.

There will be release of large quantities of epinephrine and nor epinephrine from adrenal medulla because of the Stimulation of the sympathetic nervous system during exercise and studies reported that epinephrine reduces IOP by lowering outflow resistance and by lowering the rate of aqueous formation[12] and its effects are mediated by stimulating the synthesis of cyclic adenosine monophosphate (cAMP) activation of cAMP decreases IOP by decreasing the production of aqueous humor.[13]

It has been proven that the magnitude of IOP decrease is dependent on the aerobic exercise intensity (Kielar et al. 1975; Krejci et al. 1981). The extent of fall in is correlated with the lactate levels in the blood. As a possible mechanism, hormonal regulation by an increased release of adrenaline has been suggested (Qureshi et al. 1997). The exact mechanism of IOP decrease by adrenaline is not fully elucidated yet, but it is likely that adrenaline increases trabecular outflow facility and reduces aqueous humour formation in a b-2 receptor–dependent manner (Wang et al. 2002).[14]

During isometric exercise, it has been shown that blood pressure in the ophthalmic and brachial arteries rise in parallel.Blood pressure increase during exercise is shown to be related to the strength of contraction and probably also the size of muscle mass involved.[15]

Autoregulation is a complex process involving the ANS (neurogenic control), systemic BP (myogenic control), circulating hormones (humoral control) and the endothelium. In Isometric exercise heart rate and blood pressure increase partly due to central motor command and partly by mechanical changes in response to contraction of the muscles that activate small fibres in the afferent limb of the reflex arch.[16]

While aerobic exercise can be recommended safely to patients with decreased OPP, effects of Isometric exercise training are harder to make. Bench pressing, conducted with high intensity, lead to a considerable elevation of the IOP of up to 10 mmHg, which seemed to be dependent on a Valsalva manoeuvre (Vieira et al. 2006). Even an elevation of up to 46 mmHg under maximal intensity was reached in a study conducted by Dickerman et al. 1999. In 76 patients, it could be shown that during a Valsalva manoeuvre against a pressure of 40 mmHg for 15 seconds, a closure of the iridocorneal angle due to a swelling of the ciliary body and iris tissue takes place (Dada et al. 2006). This might indicate that repeated Valsalva manoeuvre may be of pathogenic significance for the development of glaucoma (Krist et al. 2001).[14]

CONCLUSION

This study shows that the Isotonic as well as Isometric exercise causes significant increase in OPP in both eyes in the normal young adult among the age group of 18 to 21 years. Moderate intensity Isotonic exercise proves to be beneficial for ocular health as it improves ocular perfusion. The exercise protocol can be prescribed as an adjunctive to medical treatment in glaucoma patients and can also be practised as a preventive measure for maintaining eye health in persons who are susceptible for glaucoma. In glaucoma, degenerative changes may begin at younger age though it's detected at later age, so early screening at younger age and regular exercise may help in preventing the progression of glaucoma. To elucidate whether resistance training at low intensity is safe for patients with glaucoma, comparable studies must be performed in elderly persons and patients with glaucoma.

Conflicts of Interest: None

Source of Funding- Self

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Study of Variation in Breath Holding Time on Exposure to Mill Dust in Rice Mill Workers

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ABSTRACT

Background: Due to industrialization and global competitive market trend, rice mill has emerged as a major industrial activity in small medium scale sector to cater to the needs of increasing population. Indoor air pollution is a major problem in developing countries and is increasing more and more due to rapid industrialisation and ineffective pollution control measures. Occupational exposure to rice husk dust have been shown to affect functioning of different systems of the body.

Objective :1.To assess the Breath holding time (BHT) among rice mill workers compared to controls and 2.To know whether the rice mill dust has any effect on BHT with duration of working (in years) among the rice mill workers.

Method: Fifty non smoking male adult workers from various rice mills were selected for the study and fifty age and BMI matched individuals who were not exposed to such occupational hazard were taken from the general population of Mysuru city as controls. Breath holding time was recorded using mercury manometer where the subjects were advised to blow through the mouth piece after full inspiration as long as possible till the breaking point following standard methods and precautions and were statistically analysed by using student's 't' test. Further the cases were classified according to the duration of exposure and inter group comparisons were made using one way Anova.

Results: Rice mill workers showed significant decline in Breath holding time compared to controls. Also, there is a significant deterioration in breath holding time as the duration of exposure prolongs. C**onclusion**: The breath holding time was significantly declined among rice mill workers compared to controls. The findings are of importance that they demonstrate the extensive need of preventive measures to be implemented. It is advisible therefore to adopt technical preventive measures such as having a well-ventilated work areas and wearing appropriate respiratory protective devices in rice mills.

Keywords: *Rice mill dust, Rice mill workers, Breath holding time*

INTRODUCTION

Respiration can be voluntarily controlled and arrested for a variable period during any phase of respiratory cycle in physiological limits. Breath holding time is the time taken by the subject to hold the breath as long as an individual is able to and the break point is the voluntary termination of breath holding in response to the development of net ventilatory stimulus too strong to be further resisted by voluntary effort[1]. Breath holding time measures the level of threshold of respiratory center to partial pressure of carbon dioxide[2].

Indoor air pollution is a major problem in developing countries and is increasing more and more due to rapid industrialization and ineffective pollution control measures [3].Occupational health has been gaining importance for the fact that long term exposure to dust can lead to a permanent morbidity. Occupational respiratory diseases are usually caused by extended exposure to irritating or toxic substances that causes acute or chronic respiratory ailments. The incidence depends upon the chemical composition of dust, size

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of the particles, duration of exposure and individual susceptibility [4].

Present study was conducted: 1.To assess the Breath holding time (BHT) among rice mill workers compared to controls and 2.To know whether the rice mill dust has any effect on BHT with duration of working (in years) among the rice mill workers.

MATERIALS AND METHOD

The present study was conducted in various rice mills of Mysuru City. The study group consisted of 50 male workers in the age group of 25-50 years, who were working in various rice mills in Mysuru.

The control group consisted of 50 healthy male of same age group, who were not exposed to such occupational hazard. The cases and controls were matched for age and body mass index.

Criteria for selection of subjects

Inclusion criteria

- Age : 25-50 years
- Duration of exposure to rice mill dust > 1 year
- Non smokers
- Normal healthy males between the age group of 25-50 years were taken as controls.

Exclusion criteria

- Female subjects
- Smokers
- Subjects with previous history of pulmonary disease
- Subjects with signs and symptoms of respiratory infections at the time of test.
- Persons with known history of hypertension and diabetes mellitus
- Subjects with the gross structural abnormalities of vertebral column and thoracic cage.
- Known history of neuromuscular disease, malignancy and those who have undergone major abdominal or chest surgery.
- Subjects who are practising regular physical exercise, yoga, pranayama.

Collection of data

The study and control groups were selected as per inclusion and exclusion criteria. Written and informed consent was taken for the study after explaining the procedure and its significance in their vernacular language. A brief personal history was taken and a clinical examination of all the systems was done to exclude medical problems and to prevent confounding of results.

Anthropometric measurements were recorded. Body mass index (BMI) was derived by dividing the weight in kgs by the square of height in meters. This study was approved by the ethical committee of JSS medical college, Mysore.

After explaining the procedure, breath-holding time was determined by valaslva maneuver and recorded using a mouth piece attached to the mercury manometer. Valsalva maneuver consists of forced expiration against a closed glottis after a full inspiration. According to the specifications laid down in a study[5] a mouth piece was constructed which was required for this study. It consists of a hollow PVC tube 15 cm length, closed by a PVC cap at one end with a 2 mm hole in the centre. The other end was connected to PVC reducer. The thickness of the tube was 2 mm with an internal diameter of 3 cm. The bottom of the tube was connected to a three way stop cock and linked by a 50 cm rubber tube to the mercury manometer.

The subject was asked to blow through the mouth piece in sitting posture with spine erect [6] , after deep inspiration, until the pressure in the mercury manometer raises up to 40 mm Hg and is maintained until the subject can no longer hold the breath voluntarily. The time was noted using a stop watch, this records the BHT [7,8,9,10] and maintained as long as possible till the breaking point when the subject was unable to hold the breath voluntarily. The time taken for this procedure was considered as BHT. The respiratory maneuvers were demonstrated to each subject before the test. Three reproducible tests were carried out for each measurement, and the best result was selected for statistical analysis.

STATISTICAL ANALYSIS

The results were given as Mean ± Standard Deviation for both the groups. Comparisons were performed using student's t – test for two group comparisons and one way ANOVA (Analysis of variance) for multiple groups.

The p value of 0.05 or less was considered as statistically significant

RESULTS

Fifty subjects (in each group) of the age group 25 to 50 years participated in the study.

Table 1 shows the mean and standard deviation of age, height, weight, and BMI of both the cases and control showed no statistical significant difference.

Table 2 depicts a significant decline in the Breath holding time of rice mill workers when compared to controls.

Table 3 shows a significant deterioration in breath holding time as the duration of exposure is prolonged.

Table-1: Basic Physiological characteristics of subjects

BASIC CHARACTERISTICS	RICE MILL WORKERS (n=50)	CONTROLS (n=50)	SIGNIFICANCE	
			t –value	p- value
AGE in years	32.96 ± 8.12	33.52 ± 6.63	0.37	0.70, NS
HEIGHT (mts)	158.7 ± 0.99	159.94 ± 0.07	0.70	0.48, NS
WEIGHT (Kgs)	60.14 ± 8.23	62.66 ± 9.66	1.403	0.16, NS
BMI (kg/m2)	24.10 ± 5.26	24.53 ± 3.67	0.48	0.63, NS

Note: NS- Non-significant

Table 2: Mean and standard deviation of BHT among rice mill workers and controls

BHT (Mean ± SD		'p' value
Rice mill workers (n=50)	Controls (n=50)	
28.8±6.83	36.3±9.65	0.000

Note:' p' value < 0.05 is significant

Table 3: Mean and standard deviation of BHT among rice mill workers according to duration of working (in years)

Duration of working(years)			'p' value
1-10 (n=19)	11-20 (n=20)	>20 (n=11)	
30.2 ±5.36	26.7 ± 9.25	23.2 ± 7.24	0.028

Note:' p' value < 0.05 is significant

DISCUSSION

The physiology of breath holding is complex and voluntary breath hold duration is affected by many factors including practice, psychology, respiratory chemoreflexes and lung stretch[2]. It is an unstable state with changes occurring in many interrelated variables. Breath holding test is simple and rapid and the objective measure of this is its duration[11]. It is directly proportional to the lung volume at the initiation of breath holding[12].

When a breath hold test is performed at rest, tissues continue to utilize oxygen and liberate carbon di oxide therefore arterial PO_2 begins to fall and arterial PCO_2 begins to rise gradually and so the pH levels falls as a function of metabolism[13]. Increase in the CO_2 level and fall pH stimulates both peripheral and central chemoreceptors. The apnoea of voluntary breath holding is due to inhibitory impulses from higher centers which are able to balance the excitatory effects of other afferents. At the end of breath holding these excitatory impulses increase the sensitivity of the center to such a level that the voluntary control finally breaks down and the respiration commences[14,15]. Normal maximal voluntary breath-holding time is 30-60 seconds. The

breaking point is generally reached when alveolar PO_2 is 56 mm of Hg and alveolar PCO_2 is 49 mm of Hg[16]. The respiratory tract is readily accessible to noxious factors in the environment. The vulnerability of the respiratory system is increased by the large volume of air readily contaminated by aerosols and dust in the workplace that moves in and out of the lungs[17]. A large amount of dust is generated, especially during the milling activities. The incidence depends upon the chemical composition of dust, size of the particles, duration of exposure and individual susceptibility[18].

Rice mill dust has a greater impact on Breath holding time. In our study the breath holding time was significantly declined among rice mill workers compared to controls this may be due to the potential exposure to organic and inorganic dusts and synthetic chemicals generated in rice mills that may have adverse effects on respiratory health. Rice husk is known to have high silica content. This biogenic silica may cause pulmonary disease resembling asbestosis, namely pleural thickening and fibrosis [19]. Inhalation of silica dust causes inflammation and scarring in the form of nodular lesions in the lungs and affects the tiny alveolar sacs and ducts in the lungs[20].

Also, there is a significant deterioration in breath holding time as the duration of exposure is prolonged this is due to the extended exposure to irritating or toxic substances, poor ventilation, non use of face masks and lack of proper exhaust facility[21,22].

In Conclusion, in this study we found that BHT was significantly lower in rice mill workers than in controls. The breath holding test may be useful to help recognize potentially severe future lung abnormalities and to promote more effective behavioral interventions such as having a well-ventilated work areas and wearing appropriate respiratory protective devices in rice mills and regular physical exercise.

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Conflict of Interest – Nil

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Assessment of Respiratory Muscle Strength in Chronic Smokers

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ABSTRACT

Background - The hallmark of COPD is chronic airflow obstruction accompanying the dysponea and limitation of air flow. Pulmonary hyper inflation has a direct impact on inspiratory muscle function because it changes the architecture of both the diaphragm and the external inter-costal muscles displacing them from the optimal configuration for contraction. Smoking is the one of the major leading causes of COPD.

The measurement of Peak Inspiratory Pressure (PIP) & Peak Expiratory Pressure (PEP) allows a simple, reproducible, and rapid assessment of respiratory muscle strength which is extremely useful in assessing the progression of respiratory weakness.

Material & Method - The study was carried out in Department of Physiology, Narayana Medical Collage & Hospital, Nellore. Respiratory pressures were measured in both the smokers and non smokers group (24 in each group) by using digital manometer device capable of measuring both negative and positive pressures along with the mouth piece, which was in house built and calibrated by using mercury manometer.

Aim - To assess the respiratory muscle strength in chronic smokers by recording Peak Inspiratory Pressure and Peak Expiratory Pressure.

Results - PIP and PEP of nonsmokers was 72.5 mmHg ± 26.52 and 65 mmHg ± 23.46 respectively. Similarly PIP and PEP of smokers was found to be 59.57 mmHg ± 23.93 & 74.46 mmHg ± 19.17 respectively. These findings are similar to the previous studies.

Conclusion - By this study we conclude that there was a decrease in PIP in smokers indicating weakness of inspiratory group of muscles. The PEP values were found to be slightly higher than non-smokers which indicates that the inspiratory group of muscles are the first to be affected in smokers.

Keywords *- Peak Inspiratory Pressure (PIP), Peak Expiratory Pressure (PEP), Chronic Smokers*

INTRODUCTION

Muscle function is essential for both ventilation (respiratory muscles) and interacting with the environment (peripheral muscles). One of the systemic manifestations of chronic obstructive pulmonary disease (COPD) is skeletal muscle dysfunction. Various local and systemic factors are responsible for COPD .[1]

The hallmark of COPD is chronic airflow obstruction accompanying the dyspnea and limitation of airflow. Besides fixed airway limitation, COPD also give rise to increased lung volumes, a phenomenon called hyperinflation. Pulmonary hyperinflation has a direct impact on inspiratory muscle function because it changes the architecture of both the diaphragm (which becomes flatter and shorter) and the external inter costal muscles (which are lengthened), displacing them from the optimal configuration for contraction. There will be

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increased resistance and load within the system (greater airway resistance, intrinsic positive end-expiratory pressure, and impaired supply of nutrients and oxygen). In addition to this presence of inflammatory phenomena, oxidative stress, co-morbidity, age, or drugs that affect respiratory muscle, there will be further deterioration in muscle function. It is not surprising, therefore, that the muscles of inspiration in patients with COPD have less strength and endurance than those of healthy individuals of the same age. Patients with COPD clearly lose muscle function in the extremities, and this loss is characterized by reductions in strength, endurance, and efficiency. [1]

Imbalance between respiratory muscle function and load is an important determinant of dyspnea and hypercapnia. Because much of the lung and airway derangements are irreversible in COPD, the respiratory muscles appear to be an attractive target for therapeutic interventions. [2]

Measurement of peak inspiratory and expiratory pressures that a subject can generate by mouth is a simple way to asses respiratory muscle muscle strength.

AIM OF THE STUDY

To assess the respiratory muscles strength by recording peak inspiratory and expiratory pressure in chronic smokers.

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

It is a case control study. The test group includes of 24 smokers , aged between 20 - 40yrs, with duration of smoking more than 5yrs.

Inclusion criteria

Subjects aged 20 – 40 yrs.

Males.

Smokers using beedi/ cigaratte (more than 5yrs)

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.

MATERIAL AND METHOD

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)

PIEP were recorded by using digital peak inspiratory or expiratory pressure monitoring device along with the mouth piece, which was built in house and calibrated using mercury manometer.[3] Subjects were asked to come to the Laboratory (9 am to11am). After 10 minutes rest Blood pressure and Heart rate were recorded . Height & Weight were recorded to calculate Body Mass index.

Subjects were asked to exhale air completely (with out device), nose clip was applied & instructed to inspire through the mouthpiece of the device to get PIP. similarly to get PEP Subjects were asked to take deep breath (with out device), nose clip was applied & instructed to exhale into the mouthpiece of the device . Three readings were taken with a gap of one minute rest & highest value is selected for analysis.

RESULTS

Table - 1 General characteristics

Parameters	Healthy volunteers Mean ± SD	Smokers Mean ± SD
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 Cardio - respiratory parameters

Parameters	Healthy volunteers Mean ±SD	Smokers Mean ±SD
SBP (mmHg)	129.71 ± 12.78	134.79 ± 17.46
DBP (mmHg)	82.17 ± 9.59	84.6 ± 19.73
HR (beats/minute)	89.29 ± 13.22	94.4 ± 15.2
PIP(mmHg)	72.5 ± 26.52	**59.57 ± 23.93**
PEP (mmHg))	65 ± 23.46	74.46 ± 19.17

There was an increase in Systolic blood pressure & Heart Rate due to increase in sympathetic discharge. PIP were decreased in smokers compared to nonsmokers. Similar findings were observed by M.Khalil et al.[4] PEP were slightly increased in smokers compared to nonsmokers.

DISCUSSION

The respiratory muscles are as vital as the heart and can be susceptible to fatigue under certain conditions. The evaluation of respiratory muscle performance, therefore, becomes very important. Like other skeletal muscles, respiratory muscle function should be described in terms of strength and endurance. If weakness of respiratory muscles is suspected, it is necessary to test the parameters of lung mechanics which include peak inspiratory and expiratory pressure (Peak Inspiratory and Peak Expiratory pressure respectively).

The measurement of peak respiratory pressures allows a simple, reproducible, and rapid assessment of respiratory muscle strength which is extremely useful in following the progression of respiratory weakness in patients.

CONCLUSION

Respiratory muscles appear to be an attractive target for therapeutic interventions. Respiratory muscle strength decreases before lung expansion. Smoking cessation programs - Various leisure time sport activities can be Instituted at school level. Diagnosis, prognosis and in the implementation of Pulmonary rehabilitation Programs.

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Change in Relationship between body Composition and Aerobic Power in Physical Education College's Students: A 12 Weeks Longitudinal Study

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ABSTRACT

Context: Students of physical education were involved in regular physical exercise training programme. Our study aimed to assess the body composition and aerobic power over 12 weeks of exercise training program and to evaluate the relationship between body composition and aerobic power.

Settings and Design: The present longitudinal study was conducted on 100 college students of physical education. They had undergone 12 weeks exercise program i.e ten session/wk, 40min/session, with hard intensity (Rating of perceived exercise (RPE) scale 3), 12 wks duration as per Frequency, Intensity, Time & Type (F.I.T.T) principle and dynamic exercise in form of running. Material and Methods: Aerobic power was assessed using Queen's College step test. Fat mass and fat % were assessed using Omron BF 300.

Statistical analysis was done by paired "t test" to compare pre-exercise and post-exercise program parameters. Pearson coefficient was used to see the correlation between body composition and aerobic power.

Results: Aerobic power was increased significantly in both, but there was no significant correlation between aerobic power and body composition in male. In female, significant negative correlation was seen between weight and aerobic power in pre-exercise period, no significant correlation was seen between other parameters in pre as well as post-exercise program.

Conclusions: Relationship between body composition and aerobic power did not change over 12 weeks period. This might be because of lower intensity of exercise.

Key-words: *VO_2max exercise physical education*

INTRODUCTION

Exercise is a planned, structural, repetitive and purposeful physical activity which not only improves physical fitness including cardio-respiratory functions but reduce morbidity and mortality also.

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Regular exercise has favourable results on body composition. It leads to decrease in fat mass and increase in lean body mass which mainly consists of muscle mass, essential fat, water and bone[1,2]. Regular exercise improves aerobic power. However, aerobic power is limited by various factors. In the exercising human, maximal oxygen uptake (VO_2max) is limited by the ability of the cardiorespiratory system to deliver oxygen to the exercising muscles[3]. Besides this, oxygen consumption depends upon its utilization by the exercising muscle. Endurance training causes increase in mitochondrial enzyme activities in the muscle that may boost oxygen utilisation and thus may lead to improvement in oxygen consumption[4].

The present study aimed to assess the body composition and aerobic power (VO_2max) over 12 weeks of exercise training program in college students of physical education and to evaluate the relationship between them in Indian population.

We hypothesised that regular exercise would increase the lean body mass and this would show the positive correlation with VO_2max.

MATERIALS AND METHOD

The present study was conducted in department of Physiology, Govt. medical college, Nagpur.

College students of physical education at Nagpur were given detailed information about the research project including non-invasive nature of evaluation in comprehensive language to create good rapport with them and to relieve their anxiety. 100 volunteer students of both gender with age ranging between 17-25 years were participated in the study project after their informed consent. Non-smoker, non-alcoholicand those without any cardio-respiratory or systemic diseases known to interfere with the physical activity were included while those who had any regular and planned exercise were excluded. Their present, past, personal & family history was taken in detail followed by thorough clinical examination. Their cardio respiratory assessment was done within 15 days of college admission. After assessing baseline parameters, they were asked to undergo 12 weeks of F.I.T.T exercise program i.e 40min/session for 10 session/wk, with hard intensity (RPE scale 3) and dynamic exercise mainly in form of running. All the subjects were re-evaluated after 12 weeks of exercise program.

OMRON BF 300 body fat monitor was used to measure the % & total fat mass contained in the human body. It works according to Bioelectrical impedance analysis method (BIA) which is considered to be the most simple, quick, and inexpensive method.[6]

Queen's College Step test which was devised by McArdle and colleagues for college student to predict VO_2max and is considered to be valid in Indian population[5]

Subjects were instructed to step at the rate of 22 steps per min (females) and 24 steps per min (male) for 3 minute. The bench or stool height was 16.25 inches. After exercise, the subjects were asked to wait for 5 second, while their 15-second heart rate was recorded. Predicted VO_2max (ml/kg/min) was calculated by using following equation.

MALES: - PREDICTED VO_2max = 111.33 – (0.42*HEART RATE)

FEMALES : - PREDICTED VO_2max = 65.81 – (0.1847*HEART RATE)

Statistical analysis was done by paired "t" test to compare pre-exercise and post-exercise program parameters values. Pearson coefficient was used to assess the correlation between body composition and aerobic power.

RESULTS

There was no significant change in body composition in response to 12 weeks of exercise program both in male and female subjects, however aerobic power was increased significantly in both (Table 1).

There was no significant correlation between aerobic power and body composition in male while in female significant negative correlation was seen between weight & aerobic power in pre-exercise period and there was no significant correlation between other parameters in pre as well as post-exercise programme. (Table 2,3,4 and 5)

Table 1: The physical characteristic, body composition and VO_2max of male and female subjects

PARAMETERS	PRE EXERCISE	POST EXERCISE	PRE EXERCISE	POST EXERCISE
	Male (n=51) Mean ± SD		Female (n=49) Mean ± SD	
AGE (YRS)	20.18 ±1.147		19.91±1.89	

Cont... **Table 1: The physical characteristic, body composition and VO_2max of male and female subjects**

HEIGHT (M)	1.701± 0.04568		1.581 ±0.05442	
WEIGHT (KG)	60.85 ±5.873	60.63 ±5.516	52.15 ±6.495	52.51 ± 5.465
BSA (M^2)	1.70 ±0.081	1.70 ±0.077	1.51 ±0.095	1.52 ±0.085
FAT MASS %	10.67 ±4.64	10.68 ±4.45	20.62 ±4.55	20.67 ±4.82
FAT MASS (KG)	6.59 ±3.20	6.27 ±2.89	10.83 ±3.03	10.88 ±2.96
LBM (KG)	54.24 ±4.811	54.35 ±4.96	41.32 ±5.00	41.62 ±4.79
BMI (Kg/M^2)	21.04 ±2.184	20.96 ±2.087	20.87 ±2.658	21.01 ±2.282
VO_2max (ml/kg/m)	45.74 ±6.87	51.41*** ±5.96	38.47 ±3.38	41.50*** ±2.57

LBM - lean body mass, BMI-Body mass index ***: p< 0.001 very significantly increase

Table 2 : Relation between Pre exercise program VO_2max and body composition in male.

Male	**Pre VO_2 max**
Weight	-0.06
Fat Mass	0.049
Lean Body Mass	-0. 1

Table 3 : Relation between Pre exercise program VO_2 max and body composition in female.

Female	Pre VO_2 max
Weight	-0.31*
Fat Mass	-0.18
Lean Body Mass	-0.29 *

*: p<0.05, significant change

Table 4 : Relation between Post exercise program methods andVO_2max and body composition in male.

Male	**PostVO_2 max**
Weight	-0.05
Fat Mass	-0.021
Lean Body Mass	-0.05

Table 5 : Relation between Post exercise program VO_2 max and body composition in female.

Female	Post VO_2 max
Weight	-0.07
Fat Mass	-0.07
Lean Body Mass	-0.03

DISCUSSION

Aim of the study was to assess the body composition and aerobic power (VO_2 max) over 12 weeks of exercise training program and to assess the relationship between them in college students of physical education. We were expecting significant improvement in body composition i.e increase in lean body mass and increase in aerobic power and positive correlation between lean body mass and aerobic power. However,both male and female students showed significant improvement in aerobic power only. Negative correlation was seen between weight, lean body mass and aerobic power in pre-exercise period in both male and female students.

In studies conducted by Kim & Park[1] and Redman et al[7], anthropometric variables and body composition was significantly reduced in overweight persons before the exercise program than normal weight persons. Duration

and intensity of exercise might have contributed and there was relation to diet and sex. The subjects in our study had normal body composition and other anthropometric variables; in fact most of the findings were below normal. The duration of the exercise might be insufficient to produce the desired changes. Students were on optimum diet without any restriction and it was not possible for us to monitor the diet closely. All these might have accounted for no significant change in our study.

We could not get positive correlation between lean body mass and aerobic power which was contradictory with various studies.[4,8]. Goran et al [9] found that VO_2max was not influenced by excess fat mass, however in various studies it was found that persons with lower body fat would display higher aerobic power[4,8]. One of the factor which affects aerobic power may be muscle metabolism and its blood flow. With prolonged exercise programs, there is increase in muscle mass and blood flow with increased capillary density. There are various changes which occurs at tissue level, these are increase in enzymes and oxidative potential, energy stores, substrate availability, myoglobin concentration, number of mitochondria as well as size of mitochondria. Fat mass has comparatively less blood supply and it is deficient in various metabolic enzymes. Fat mass would exert negative effect on VO_2max[10]

In our study, FITT of exercise program was ten sessions/wk, 40min/session, somewhat hard intensity (RPE scale 3), 12 weeks duration, and dynamic exercise mainly in form of running. Intensity and duration of exercise was less in our exercise program. This might be the cause of insignificant correlation.

In females, during pre-exercise period, significant negative correlation was seen between lean body mass and aerobic power. This might be due to their sedentary lifestyle. However, with exercise this negative significant correlation got changed.

Thus to conclude, aerobic power was increased significantly with the 12 weeks of exercise program in physical education college student, however relationship between body composition and aerobic power did not change over 12 weeks period. This might be because of lower intensity of exercise. Physical education college students should undergo high intensity exercise training for adequate duration.

Conflict of Interest - Nil

Source of Funding- Self

Ethical Clearance – Taken

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Can Trained Wind Instrument Blowers Develop Higher Inspiratory Spirometric Parameters Along with Expiratory Spirometric Parameters?

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ABSTRACT

Inspiratory spirometric parameters (ISP) were rarely evaluated in wind instrument blowers. Our study aimed to assess whether the trained wind instrumentalist could develop higher ISP along with expiratory spirometric parameters (ESP).

30 wind instrument blowers (group A) and 30 non-blowers (group B) male subjects were investigated by a computerized spirometer (RMS medspiror). The data was collected, tabulated and analyzed by using unpaired 't' test with 'p' value of 0.05 as cut off value for the measure of significance. Group A subjects showed a significantly higher actual value of ESPs. i.e Forced vital capacity (FVC), Forced expiratory volume in 1st sec of FVC (FEV1), Peak expiratory flow rate (PEFR) and ISPs i.e Forced inspiratory vital capacity (FIVC), Peak inspiratory flow rate (PIFR) and Inspiratory capacity (IC) than group B. It was concluded that regular training of wind instrument blowing by using the whole vital capacity skillfully during the play with deep inspiration followed by prolonged expiration through the instrument might have contributed to higher values in trained blowers.

Keywords : *Inspiratory expiratory spirometry parameters wind instrumentalist*

INTRODUCTION

Majority of the studies conducted on wind instrumentalists have evaluated only expiratory spirometric parameters (ESPs). The study conducted by Bouhuy[1] revealed higher vital capacity (VC) in brass players than the non-blowers. In our previous study[12] % predicted ESPs values i.e Forced vital capacity (FVC), Forced expiratory volume in 1st sec of FVC (FEV1), Peak expiratory flow rate (PEFR), FVC 25-75% and Maximum voluntary ventilation (MVV) were higher in wind instrument blowers than the non-blowers.

The study conducted in similar occupation i.e. glass blowers by Zuskin et al[22] revealed that glassblowers showed significant increased FVC, FEV1 and the maximum flow rates at 25% and 50% of FVC (FEF25% and FEF50%) as compared to non-blower. Navratil & Rejsek[17] showed higher % predicted FVC and FEV1 in full time glass blowers than part time blowers, and non-glass blowers. Munn et al[15] also showed higher % predicted mid expiratory flow (MEF), FEF 25-75% and MVV than part-time blowers and the non-blowers.

Present study was designed to assess whether the wind instrument blowers could also develop higher ISPs i.e Forced inspiratory vital capacity, peak Inspiratory flow rate (PIFR) and Inspiratory capacity (IC) along with ESPs.

MATERIALS AND METHOD

After obtaining the approval from the institutional ethics committee, the present study was conducted on 30 trained wind instrument blowers (Group A) and 30 non-blowers (Group B) at military music training school.

Inclusion criteria:- Healthy male non-smoker subjects with age ranging from 20-50 years were included. Nonsmoker was either an ex-smoker or who left smoking for more than 1 month.

Exclusion criteria:- Cigarette or bidi or pipe smoker who has continued smoking till the day of study testing and those suffering with acute and chronic illness were excluded.

Computerized flow sensing turbine type of RMS Medspiror with an internal correction of BTPS was used for evaluating ISP. After signing the informed consent form from the volunteer subjects, their name, age, height, weight, date of performing the test and atmospheric temperature was fed to the computer. Prior to testing, the procedure was demonstrated. The subject was asked to inspire deeply followed by rapid and forceful expiration into the mouthpiece of RMS medspiror. Best of the three recorded readings was noted [13,19,20] and actual values and not the % predicted values of PIFR, IC and FIVC were analyzed by using unpaired 't' test. 'P' value of 0.05 was taken as cut off value for the measure of significance. Statistical analysis was done by graph pad prism 5 software.

FINDINGS

Age and BMI was statistically matched in both the groups as shown in table no. 1

Group A subjects showed significantly higher actual value of ESPs i.e FVC, FEV1, and highly significant PEFR than group B as shown in table no. 2

Group A subjects showed a significantly higher actual value of ISPs i.e IC and highly significant FIVC & PIFR values than group B as shown in table no. 3.

Table no.1:- Baseline parameters

Baseline Parameters	**Group A(n = 30) Mean ± SD**	**Group B (n =30) Mean ± SD**	**p value**
Age (years)	32.01 ± 5.15	33.02 ± 4.04	0.0512*
BMI (Kg/m^2)	23.23 ± 1.26	22.74 ± 2.75	0.3986*

BMI - Body mass index ** Statistically significant * Statistically not significant

Table no.2:- Expiratory spirometric parameters(ESPs)

Spirometric Parameters	**Group A (n = 30) Mean ± SD**	**Group B (n =30) Mean ± SD**	**p value**
FVC (L)	4.58 ± 2.83	3.15 ± 1.23	0.0312 **
FEV1(L)	3.85 ± 2.56	2.13 ± 1.11	0.0147 **
PEFR(L/s)	9.18 ± 1.74	5.97 ± 2.03	0.0000 **

** Statistically significant * Statistically not significant

Table no. 3:- Inspiratory spirometric parameters (ISPs)

Spirometric Parameters	**Group A (n = 30) Mean ± SD**	**Group B (n =30) Mean ± SD**	**p value**
FIVC (L)	3.89 ± 2.14	2.16 ± 2.03	0.0000 **
PIFR(L/s)	6.74 ± 2.76	4.23 ± 1.67	0.0000 **
IC (L)	3.67 ± 1.95	2.23 ± 1.12	0.0229 **

** Statistically significant * Statistically not significant

DISCUSSION

Specificity, intensity and duration of training are basic principles applicable to all skeletal muscle including respiratory muscles in wind instrumentalists. The effects of training are very specific to the muscle groups being involved[8,18]. This fact is justified by the study done by Nam DH et al[16] which revealed that the respiratory muscle training increases the respiratory muscle strength. According to the study conducted by Dries et al[3], wind instrument playing might be considered as a continuous form of respiratory muscle training especially expiratory muscle, due to the expiratory maneuvers necessary for sound generation. Expiratory spirometric parameters were higher in wind instrument blowers[1,12] and in glass blowers[15,17,22] than the part time blowers[15] and non-blowers[1,12,15,17].

The principle of intensity is based on the concept of incremental loading that must be applied to a muscle for a training response to occur[18]. Blowing low notes on wind instrument indicates a low resistance to expiration while playing high notes requires a strenuous expiratory strain[4]. Thus this high intensity muscle training causes improvement in respiratory muscle function that has been shown to be due to recruitment of large proportion of muscle fibers [8,10].

The duration of training required to obtain a physiological response is unclear, yet general studies show that it can be attained after 4 to 12 weeks of training. Similarly, the benefits of training will be lost after 3-4 weeks of cessation of exercise[6,8]. Navratil & Rejsek[17] showed higher % predicted FVC and FEV1 in full time glass blowers than part time blowers & non-glass blowers. Munn et al[15] also showed higher % predicted mid expiratory flow (MEF), FEF 25-75% and MVV than part-time blowers and the non-blowers. The blowing experience in our study group ranged from 4 years to 12 years. And they had undergone continuous training of blowing about 8 to 12 hours/day for 5 days a week.

Fiz et al[5] found that playing techniques and type of blowing instrument might be responsible for higher ESPs in trumpet blowers. Brzęk et al[2] and Wolfe et al [21] concluded that musicians are particularly prone to respiratory muscles overload beginning with lung tissue expansion during prolonged performance of wind instruments. Lesnick et al[13] found no significant difference between cases and control groups in MVV, FEV1, FVC, MEF and peak expiratory or inspiratory pressure. In contrast, Gilbert TB[7] found breathing difficulties in wind instrument blowers.

It was concluded that regular blowing pattern of using the whole vital capacity skilfully during the play with deep inspiration might have contributed in strengthening inspiratory muscles and subsequently the higher ISPs values while prolonged expiration after deep inspiration through the instrument might have contributed in strengthening expiratory muscles and subsequently higher ESPs values in trained wind instrument blowers.

Conflict of Interest - Nil

Source of Funding- Self

Ethical Clearance – Taken

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Correlation of Anthropometric Profile and Pulmonary Functions in Healthy Young Adults

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ABSTRACT

Obesity is a commonly encountered health problem in the young adult population of today. It is negatively associated to the pulmonary functions. The present study was planned to assess the impact of anthropometric profile on pulmonary functions in healthy young adults (17-30 years). Hundred (male and female) subjects, without any major or minor illnesses, were selected for the study, based on predefined inclusion and exclusion criteria. Pulmonary function parameter recorded were forced vital capacity (FVC), forced expired volume in 1 second (FEV_1) and

FEV_1%. Pulmonary functions were recorded on a Digital portable desktop spirometer of COSMED model Pony FX. Weight, height, waist circumference and hip circumference were measured. Body mass index (BMI) and waist hip ratio (WHR) were calculated. Weight and body mass index (BMI) are used as the measures of overall adiposity whereas waist hip ratio (WHR) and waist circumference (WC) are used as the measures for abdominal obesity.

Values of all the pulmonary function parameters recorded in female subjects were found to be lower than the male subjects except FEV_1 %. Our study showed that the pulmonary functions are not significantly influenced by anthropometric indices like body mass index, waist circumference and Waist–Hip ratio in healthy young adults.

Keywords: *FVC, FEV_1, BMI, waist hip ratio, young adult*

INTRODUCTION

Pulmonary function tests (PFTs) have evolved from tools for conducting physiological studies to clinical tools for the diagnosis, management, and follow-up of respiratory diseases because they can be used to provide objective information about the status of an individual's respiratory system [1].

PFTs are affected by factors including diet, obesity, air pollution, and physical activity level. Last five decades has seen a significant change in the anthropometric data of young adults owing to factors such as increasing body height and body mass index [1].

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The consequences of industrialization and urbanization, which lead to decrease in physical activity, together with substantial dietary changes and overall pattern of life style, promote weight gain[2].

Obesity and physical activity are the major factors that affect pulmonary functions[3]. Obesity is one of the most frequently found health risks and its prevalence appears to be increased all over the world because of physical inactivity and westernized diet .Weight and Body Mass Index (BMI) as measures of overall adiposity are used as predictors of pulmonary function in many epidemiologic studies. These measures are widely accepted as determinants of pulmonary function. Abdominal adiposity may influence pulmonary function through a mechanism that is distinct from that of overall adiposity [4].

Waist to hip ratio (WHR) is highly correlated with abdominal fat mass and is therefore; often used as a surrogate marker for abdominal or upper body obesity.

The predicted normal WHR in men is 0.93 and in women it is 0.83 [2].

Pulmonary functions vary in healthy people and are greatly influenced by individual weight, height, age, sex, race, nutrition, body surface area and environmental factors. Most of the epidemiological studies have considered age, sex and height as major predictors of pulmonary functions [5]. The influence of various other anthropometric measurements like body mass index, waist circumference and waist-hip ratio , on pulmonary function tests has received less attention, particularly in younger age group. Hence the present study was undertaken to study the influence of various anthropometric indices on pulmonary function tests in the young adults (males & females).

MATERIAL AND METHOD

The present study was carried out in the Central Research Lab (CRL) of ESIC Medical College & Hospital, Faridabad. This study was done as per ICMR STS guidelines.

The purpose and procedure of the study was explained to each of the subjects prior to the start of the study. Institutional Ethical Clearance (IEC) was taken after approval of the project by ICMR. 100 healthy (male and female) volunteers between the age group of 17-30 years were recruited for the study after taking written, informed consent.

Inclusion criteria:

Young adults of both sexes between 17-30 years of age without any major or minor medical or surgical illness.

Exclusion criteria for both groups:

1) Participants with history of cardiopulmonary disease

2) Chronically ill

3) Medication for long duration

4) History of any major surgery (cardiac, pulmonary, abdominal) related to study,

5) Smoker and alcoholics

Participants were instructed to empty their bladder prior to anthropometric measurements.

Height was measured using stadiometer. Subjects were instructed to stand straight with feet flat, heels and knees together and legs straight with arms at side and looking straight ahead. Their heels, hips, shoulder blades and occiput were pressing against the vertical bar. Height was noted against the horizontal slider which was on the top of the head pressing hairs. Heights were measured within the accuracy of 0.1 Centimeter.

Subjects were instructed to wear light cloths and to stand on foot bar of weighing machine without any footwear. **Weight** was measured to the nearest 100 g using digital scales.

BMI [6] was calculated using Quetlet's index as weight (kg) over height (m^2).

BMI = Weight (Kg) / (height in meter) ^{2}

Waist circumference (WC) was measured as per established method. A D-loop non stretch fiberglass tape was used for the waist circumference measures. Waist circumference was measured at the smallest circumference between the costal margin **and** the iliac crest to the nearest 0.1 cm while the participant in st**and**ing with the abdomen relaxed, at the end of a normal expiration. Where there was no natural waistline, the measurement was taken at the level of the umbilicus.

Hip circumference was measured at the maximum circumference between the iliac crest **and** the crotch while the participant was st**and**ing **and** was recorded to the nearest 0.1 cm.

Waist: hip ratio was then calculated from the waist **and** hip measures (waist circumference/hip circumference).

The volunteers were asked to avoid beverages, like tea and coffee and other stimulants and come with light breakfast before reporting and all tests were done in the forenoon to avoid diurnal variation in respiratory parameters. Pulmonary functions was recorded on a Digital portable desktop spirometer of COSMED model Pony FX.

The following parameters were recorded-

Forced vital capacity (FVC),

Forced expiratory volume at first second (FEV_1),

FEV_1 /FVC (FEV_1 %)

after explaining and demonstrating the procedure and three recordings were done and the best of the three was considered.

Statistical analysis

All Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 19 software for windows. The variables were expressed as the means and standard deviations, and p value was calculated. Pearson's correlation coefficient was determined to find the association of various indices.

The collected data were entered in Microsoft Excel computer program and checked for any inconsistency.

Significance testing for trend were conducted using regression models. A value of $p < 0.05$ was to determine statistical significance. Regression coefficients and 95 percent confidence intervals were also calculated.

RESULTS

In this study, there were a larger number of males than females (63% vs 37%). Most of the young adults in the study were found in the age group of 17-19 years.

TABLE 1 - Characteristics of subjects studied:

Variable	Mean	Standard Deviation
Age (years)	20.75	2.99
Weight (Kg)	59.67	12.86
Height (cm)	167.84	9.06
BMI (kg/m^2)	21.12	3.83
Waist Circumference (cm)	80	3.75
Hip Circumference (cm)	94	2.74
Waist/ Hip ratio	0.85	0.06

Table 2: Baseline characteristics of male and female young adults

Parameter	Male (n=63)	Female (n= 37)	P value
Age (Years)	20.87	20.54	0.594
Weight(Kg)	63.61	52.96	<.0001*
Height(cm)	172.95	159.14	<.0001*
BMI (kg/m^2)	21.27	20.86	0.602
Waist Circumference (cm)	82.1	76	0.001
Hip Circumference (cm)	94.3	93	0.367
Waist/ Hip ratio	0.87	0.82	<.0001*

Data are expressed as mean, *P<0.001- Highly significant

The anthropometric indices other than body mass index, waist circumference and hip circumference were significantly lower in females compared to males.

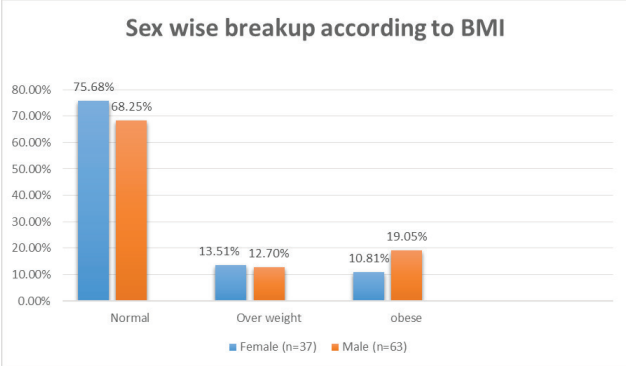

Figure 1: Sex wise breakup according to BMI

BMI (kg/m^2): 18.1-22.9 (Normal)

23-25 (Overweight)

>25 (Obese)

Parameter	Male (n= 63)	Female (n=37)	P Value
FEV_1 (L/s)	3.59	2.38	<.0001**
FVC (L/s)	4.21	2.74	<.0001**
FEV_1 /FVC%	85.94	87.05	0.502*

Table 3: Comparison of Pulmonary function parameters in male and female adults

* P>0.05-Not significant

** P<0.001- Highly significant

The respiratory parameters other than FEV_1 % were significantly lower in females compared to males.

Table 4: Correlation of Spirometric parameters with BMI in Males and Females

Correlation of BMI with		Pearson correlation coefficient (r)	p-value
Male	FVC	0.251	0.047*
	FEV_1	0.009	0.942
	FEV_1 %	-0.049	0.001**
Female	FVC	0.290	0.082
	FEV_1	0.160	0.345
	FEV_1 %	-0.251	0.134

* P<0.05- Significant ** P<0.001- Highly significant

Table 5: Correlation of Spirometric parameters with WHR in males and Females

Correlation of WHR with		Pearson correlation coefficient (r)	p-value
Male	FVC	-0.079	0.539
	FEV_1	-0.220	0.084
	FEV_1 %	-0.186	0.145
Female	FVC	0.080	0.639
	FEV_1	0.000	0.998
	FEV_1 %	-0.273	0.103

Table 6: Correlation of Spirometric parameters with WC in males and Females

Correlation of WC with		**Pearson correlation coefficient (r)**	**p-value**
Male	FVC	0.138	0.282
	FEV_1	-0.038	0.77
	FEV_1 %	-0.285	0.024*
Female	FVC	0.209	0.215
	FEV_1	0.131	0.440
	FEV_1 %	-0.026	0.220

* P<0.05- Significant

Table 7: Multiple regression norms for the prediction of pulmonary function measurements

Pulmonary function measurement	**Variable**	**Regression equation**	**R**	**R2**	**SEE**
FVC	BMI	2.538+0.53(BMI)	.214	.046	.938
	W_H	-0.875+5.332(W_H)	.335	.112	.905
FEV1	BMI	2.816+0.16(BMI)	.007	.006	.774
	W_H	.011+3.682(W_H)	.287	.082	.744
FEV_1 %	BMI	102.451-0.762(BMI)	.367	.135	7.443
	W_H	111.173-29.153(W_H)	.220	.048	7.805

BMI- Body mass index; W_H: Waist hip ratio; SEE, standard error of estimate.

The above table shows the multiple regression norms for the prediction of pulmonary function measurements

DISCUSSION

We investigated the relation of various anthropometric parameters with pulmonary function in young adults in a cross sectional study.

The results of our study showed that the mean FVC and FEV_1 of male were significantly higher than female. Similar to our results, an increasing number of pulmonary function studies have demonstrated that there exist significant variation between male and female lung functions [7-9] and values in boys/males were significantly higher as compared to that of girls/females [7, 10]. Gupta and Gupta found that the mean values of all pulmonary function measurements were higher in boys as compared to girls but statistically significant difference($p<0.001$) was found for FVC and FEV_1 [11]. Contrary to our findings, the Spirometric values of females were generally higher than those of males in a study done by Joyashree et al in 2014 [12].

The reasons behind these variations might be hormones, structural and morphological differences. Increased estrogen levels tend to increase fluid retention and therefore increase blood volume, which could potentially affect gas exchange in the lung. In addition, progesterone and oestrogens receptors have recently been identified in mast cells in human airways. This discovery may help to explain and account for some of the effects of sex hormones in airway function and differences in ventilation [13].

We found that FEV_1% was higher in females when compared with males. Ghobain[7] and Bandyopadhyay[9]

also observed that FEV_1 % in female was greater than male which was not significant. Gender differences in pulmonary function can be explained by smaller-diameter airways relative to lung size, and these differences probably become significant relatively late in the growth period of the lung. Even when corrected for sitting height, relative to men adult women have smaller lung volumes and lower maximal expiratory flow rates. It was found that mature men have a larger lung size brought about by a greater number of alveoli relative to that in mature women [14].

WC is negatively correlated to FEV_1 and FEV_1 % in males in our study, the correlation being statistically significant in case of FEV_1 %. WC is negatively correlated to FEV_1 % in case of females but it is not statistically significant.

WHR is negatively correlated with FVC, FEV_1 and FEV_1 % in males in our study but is not significant. There is no correlation between FVC, FEV_1 and WHR in case of females. In females there is negative correlation between WHR and FEV_1 % but not significant.

We found significant negative correlation between BMI and FEV_1 % in males. In females there is negative correlation between BMI and FEV_1 % but it is not significant.

A significant negative correlation was observed between BMI and all the measured pulmonary parameters by Y. Saxena et al.[15], J. Dayanand [16] and Soundariya et al [5].

Soundariya et al [5] and Shaheen AA and his colleagues[17] found that FEV_1% did not have a significant correlation with the anthropometric indices.

In our study we have observed a positive correlation in the lung function parameters studied (FVC, FEV_1) with BMI of the subject. This can be explained by the fact that all our subjects are within the normal range of BMI for their age and sex. These observations are in agreement with several cross sectional studies that found association of FVC and FEV_1 with baseline BMI [10].

Rinki handa et al[18] concluded that body fat percentage and its distribution are inversely associated with FEV_1 and FVC except FEV_1 /FVC ratio. This implies that there is no direct effect on airways.

Lazarus et al found no inverse associations of waist circumference and waist/hip ratio with FVC in women[19].

Contrary to our findings, Soundariya et al [5] showed that the pulmonary functions are significantly influenced by anthropometric indices like body mass index and waist circumference.

Our study showed that the pulmonary functions are not significantly influenced by anthropometric indices like body mass index, waist circumference and waist–hip ratio in healthy young adults. Our findings can be explained by the fact that all our subjects are within the normal range of BMI, WC and WHR for their age and sex.

Limitations of the study: More number of subjects should be obese and over-weight in the study. More number of female subjects should be recruited in the study for better, accurate and clear results. A larger sample size and a longitudinal study will definitely be of a great value in predicting the relationship between pulmonary function tests and anthropometric parameters.

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Conflict of Interest: Nil

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Effect of Exercise on Blood lactate Levels in Male and Female 1st MBBS Students

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ABSTRACT

AIM: The study is aimed to investigate the effect of exercise on blood lactate levels in male and female 1st MBBS students

OBJECTIVES: To compare Blood lactate levels after exercise in male and female young students

METHOD: The present study is carried out in a group of 50 healthy, 1st year MBBS students of both sexes who are not regular athletes.25 males between the age group of 17-19 years and with normal BMI were selected as Group A and 25 Females with age and BMI matched were selected as Group B.The study was conducted in Mahavir Institute of Medical sciences,Vikarabad.Blood lactate was estimated in resting and post exercise phase using Barker and summerson method. each subject exercised on a bicycle ergometer with incremental loads until the maximum is reached at exhaustion. Work output attained is calculated from a record of the number of revolutions and loads employed.work capacity was expressed in watts.

RESULTS: Statistical analysis was done using unpaired t test.There was a significant rise in blood lactate levels post exercise in Group B(females) as compared to Group A(males).

CONCLUSION: The rise in Blood lactate levels post exercise is more in females compared to males.

***Keywords*:** *Blood lactate,exercise.*

INTRODUCTION

Benefits conferred by regular physical activity such as lower Blood pressure levels [lower incidence of Hypertension], lower risk of coronary heart disease, lower and better lipid profiles, stronger bones etc., to name a few, have been well documented and established. Regular physical activity also induces a sense of well being - a clear psychological benefit.

Physical exercise is an activity in which every human being engages to one degree or another during the course of his life. Therefore the study of exercise physiology assumes immense significance from the physiologists' point of view. Exercise calls forth the participation of almost all the bodily systems and hence the value of its study in physiology.

Physical work may be static or dynamic. The terms "anaerobic," "Isometric", "Resistive" and" static" refer to activity that is predominantly fueled by anaerobic breakdown of Glucose to Lactate. This type of exercise is performed at a relatively constant muscle length [Isometric] and in its pure form involves no movement [static]. Thus no external work is performed. Static work is stressful and less efficient in terms of energy utilization and has little training value.

Dynamic work is associated with isotonic contractions producing external work. The terms "aerobic", "Isotonic," and "dynamic" are used interchangeably to refer to activity that is predominantly fuelled by oxidative Phosphorylation [aerobic] and

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involves rhythmic contraction of flexor and extensor muscle groups. The endurance and power output is much better in dynamic work. Static and dynamic exercises have very different acute and chronic physiological responses. Isotonic or dynamic exercises by subjecting the 02 transport system to stress may increase endurance while having little effect on strength of muscle. These are the exercises of choice for training purposes.

During power exercises such as sprinting, when the rate of demand for energy is high, glucose is broken down and oxidized to pyruvate, and lactate is then produced from the pyruvate faster than the body can process it, causing lactate concentrations to rise. The production of lactate is beneficial because it regenerates NAD^+ (pyruvate is reduced to lactate while NADH is oxidized to NAD^+), which is used up in oxidation of glyceraldehyde 3-phosphate during production of pyruvate from glucose, and this ensures that energy production is maintained and exercise can continue. (During intense exercise, the respiratory chain cannot keep up with the amount of hydrogen atoms that join to form NADH, and cannot regenerate NAD^+ quickly enough).

The resulting lactate can be used in two ways:

1)Oxidation back to pyruvate by well-oxygenated muscle cells, heart cells, and brain cells

Pyruvate is then directly used to fuel the krebs cycle

2) Conversion to glucose via gluconeogenesis in the liver and release back into circulation[1].

However, lactate is continually formed even at rest and during moderate exercise. Some causes of this are metabolism in red blood cells that lack mitochondria and limitations resulting from the enzyme activity that occurs in muscle fibers having a high glycolytic capacity[1].

Many methods are available to measure the exertional levels of individuals. One way is to classify the work as light, moderate and heavy based on oxygen consumption; being less than 1 liter/min. or 1-2 L/min, or more than 2L/min.respectively. Alternatively ergometers may be used, which register the amounts of mechanical work per unit time. The ones most frequently used are,

"Bicycleergometer", "Treadmill", "Master's step" test etc. Treadmill and step tests are technically non-ergometric, since mechanical work done in walking, runningand stepping is not measured accurately. Bicycle ergometers are usually preferred for evaluation of physical capacity. Different designs of exercise tests have been used, but the one most often preferred is incremental exercise test on bicycle ergometer with step-wise increase in loads at regular time intervals. The bicycle ergometer provides the expression of work in watts or kg. Meters per minute.

MATERIALS AND METHOD

The present study is carried out in a group of 50 healthy, 1st year medical

students of both sexes who are not regular athletes in Mahavir Institute of Medical Sciences,Vikarabad.

GROUP A:

25 males between the age group 17-19 years were selected as Group A

GROUP B:

25 females between the age group 17-19 years were selected as Group B

Inclusion criteria for the study:

1) Students who do not engage in regular or strenuous exercise

2) Normal BMI

3) no history of any acute or chronic illness

Exclusion criteria:

1) History of any acute or chronic illness

2) smokers

The subjects were all well informed about the experimental purpose and protocol and oral consent obtained.

Before undertaking the exercise regimen, blood hemoglobin concentration, lactate level, and pulse rate were determined.

Blood Hemoglobin estimation: using sahli's acid hematin method

Blood lactate estimation: using Barker & summerson method

Pulse rate: counting the radial pulse for one complete minute

Exercise regimen: each subject exercised on a bicycle ergometer with incremental loads until the maximum is reached at exhaustion. Work output attained

is calculated from a record of the number of revolutions and loads employed.work capacity was expressed in watts.

Statistical analysis:

Statistical analysis was done using unpaired t test and Microsoft excel were used.

P value <0.05 was considered as statistical significant.

The results were expressed as Mean ± Standard Deviation.

FINDINGS

Table:1 – GROUP A

Statistical data	Hemoglobin conc(gm/dl)	Work capacity (watts)	Pulse rate (beats/min)			Blood lactate (mg/dl)		
			Resting	Postexercise	rise	Resting	Postexercise	rise
Mean	10.57	114.32	74.6	151	76	12.96	48.4	35.44
S.D	1.95	19.18	4.8	9	6	2.8	6.74	6.44
S.E	0.39	3.83	0.96	1.8	1.2	0.56	1.35	1.29

Table:2- GROUP B

Statistical data	Hemoglobin conc(gm/dl)	Work capacity(watts)	Pulse rate (beats/min)			Blood lactate (mg/dl)		
			Resting	Postexercise	rise	Resting	Postexercise	rise
Mean	8.82	87.24	76.44	158.36	81.92	12.48	54.72	41.56
S.D	0.92	7.81	4.46	9.4	4.91	2.35	7.44	5.91
S.E	0.18	1.56	0.9	1.89	0.98	0.47	1.49	1.18

The Variation of rise in Blood lactate levels between Group A(males) and Group B(Females) was statistically significant (P =0.001)

DISCUSSION

Several studies were devoted to the methodology of recording human performance and their standardization. Ergometers were developed to register the amounts of mechanical work per unit time. Mechanical Bicycle Ergometer was designed by Van Dobelin[2] and was manufactured by Monark-crescent AB, Varberg, Sweden.

Exercise tests of different designs had been developed. Sjostrand and Wahlund preferred Sub-maximal exercise test with stepwise increase in loads, as they resulted in steady circulatory states at each level., Larsson et al advocated a sub maximal work performance with continuous or nearly continuous increase in load. Theadvantage of the design was a shorter work-time and better precision in the estimation of the physical capacity[3].

The onset of fatigue in heavy exercise is often associated with increase in blood lactate concentration[4]. When exercise load is increased progressively, energy supply from aerobic metabolism (oxidative phosphorylation) may not be adequate and therefore anaerobic metabolism (anaerobic glycolysis) must

be utilized to supplement the energy supply. Basic biochemistry tells us that anaerobic glycolysis leads to an equal production of lactate and hydrogen ions[5]. Most of the released hydrogen ions will be buffered, and only a small part (~0.001 %) will be free in the cytosol, resulting in a decrease in muscle pH. The decrease in muscle pH will interfere with biochemical and physiological processes and has for a long time been considered a factor in fatigue[6].

At low pH the affinity of ca++ ions for tropinion is reduced. Further fall in pH inhibits some key glycolytic enzymes, ex. Glycogen phosphorylase and phospho-fructokinase. Thus lactic acid may affect both the contractile mechanism and energy supply adversely. Thus rise in blood lactate concentration which heralds the transition from aerobic to anaerobic muscle metabolism and triggers fatigue is a valuable indicator of severity of exertion.

Lactate produced during anaerobic exercise can be removed during aerobic exercise and recovery through the Cori cycle. In addition, cardiac muscles[7] and slow twitch muscle fibers[8] are another major sources for lactate removal, where lactate is converted to pyruvate and acetyl-CoA to be oxidized in the Krebs cycle.

Because skeletal muscle is the major source of lactate production during strenuous exercise[9] , and the men had more muscle mass than the women, it might be expected that men could produce more lactate and might have higher peak blood lactate concentration. There is some evidence, however, that women have higher plasma epinephrine concentrations during strenuous exercise[10]. Epinephrine stimulates glycogenolysis and, therefore, may enhance lactate production. Thus, the women could have had a higher blood epinephrine concentration during strenuous exercise which might help compensate for a lower lactate production from their smaller muscle mass.

Another possible explanation for the similar peak blood lactate values between men and women in this study may be that blood lactate concentration is affected not only by the lactate diffusion into the blood but also by the blood volume into which it diffuses. Because women have a smaller total blood volume (4.0 to 4.5 l) than men (5.0 to 6.0 l) [11], a smaller amount of lactate would be required to produce a similar blood lactate concentration.

CONCLUSION

There was significant rise in Blood lactate levels in Females as compared to Males with exercise.

Source of Funding: Self

Ethical Clearance: Taken from Scientific Ethical committee,Mahavir Institute of Medical Sciences,Vikarabad,Telangana.

Conflict of Interest – Nil

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Gender Differences in Vital Capacity, Respiratory Minute Volume, Maximum Voluntary Ventilation with Exercise

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ABSTRACT

AIM: The study is aimed to investigate the gender differences in Vital capacity, Respiratory minute volume,Maximum voluntary ventilation with exercise.

OBJECTIVES: To compare Vital capacity,Respiratory Minute volume and Maximum voluntary ventilation in males and females post exercise.

METHOD: The present study is carried out in a group of 50 healthy, 1st year MBBS students of both sexes who are not regular athletes.25 males between the age group of 17-19 years and with normal BMI were selected as Group A and 25 Females with age and BMI matched were selected as Group B.The study was conducted in Mahavir Institute of Medical sciences,Vikarabad. Vital capacity was determined using wet spirometer.

Respiratory Minute Volume (RMV) was determined by collecting expired air into a Douglas bag while the subject breaths under restful conditions for one minute. Maximum Voluntary Ventilation (MVV) was recorded by asking the subject to breath as rapidly and as deeply as he can for a -15second interval. The volume of air moved out is collected in a Douglas bag and then measured by displacing it into spirometer. Each subject exercised on a bicycle ergometer with incremental loads until the maximum is reached at exhaustion. Work output attained is calculated from a record of the number of revolutions and loads employed.work capacity was expressed in watts.

RESULTS: Statistical analysis was done using unpaired t test.There was a signicant increase in Vital capacity and Maximum Volunatary ventilation post exercise in Group A(males) as compared to Group B(females) and the increase in Respiratory minute volume between Group A and Group B was not staistically significant.

CONCLUSION: The increase in Vital capacity and Maximum voluntary ventilation was more in males compared to females after exercise.

Keywords*:Vital capacity,Maximum voluntary ventilation.*

INTRODUCTION

Physical activity in the form of carefully designed exercise regimens is exploited to be valuable diagnostic tools. Functional tests have gained wide application in Medical practice and have proved to be of immense diagnostic value. Diagnostic tests are based on the principle that functional inadequacy of an organ system is more apt to become apparent when the organ, or organ function is subjected to stress. Exercise tests are being more widely applied in the investigation of cardiac & pulmonary disorders. A number of exercise protocols have been developed which employ Ergometers of various kinds to facilitate diagnostic studies. Exercise induced changes in ECG have identified more people at risk of ischemic heart disease, than was otherwise realized, enabling early attention.

Exercise regimens are designed to be of therapeutic value as well. In certain types of injuries, diseases of neuromuscular or musculo skeletal systems, exercises

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therapy is recommended for restoration of function; known as Motor Rehabilitation. Suitable exercises are administered in conditions such as cerebral palsy, poliomyelitis, stroke [Cerebrovascular accident] with paresis or paralysis etc. for regaining motor control.

Physical exercises are generally grouped into three types, depending on the overall effect they have on the human body[1]:

1) **Aerobic exercise** is any physical activity that uses large muscle groups and causes the body to use more oxygen than it would while resting1.The goal of aerobic exercise is to increase cardiovascular endurance[2]. The terms "aerobic", "Isotonic," and "dynamic" are used interchangeably to refer to activity that is predominantly fuelled by oxidative Phosphorylation.

2) **Anaerobic exercise,** which includes strength and resistance training, can firm, strengthen, and tone muscles, as well as improve bone strength, balance, and coordination[1]. The terms "anaerobic," " Isometric", "Resistive" and" static" refer to activity that is predominantly fueled by anaerobic breakdown of Glucose to Lactate.

3) **Flexibility** exercises stretch and lengthen muscles. Activities such as stretching help to improve joint flexibility and keep muscles limber.The goal is to improve the range of motion which can reduce the chance of injury[3].

In this study,The work capacity is quantitated in terms of certain respiratory parameters(Vital capacity(VC),Respiratory minute volume(RMV), Maximum Voluntary Ventilation (MVV). Generally speaking a good physique implies greater exertional abilities but it is too simplistic to be of value in physiology. Hence a detailed study is called for to make on objective assessment of work capacity in relation to certain respiratory constraints.

Many methods are available to measure the exertional levels of individuals. One way is to classify the work as light, moderate and heavy based on oxygen consumption; being less than 1 liter/min. or 1-2 L/min, or more than 2L/min.respectively. Alternatively ergometers may be used, which register the amounts of mechanical work per unit time. The ones most frequently used are Bicycle ergometer. Different designs of exercise tests have been used, but the one most often preferred is incremental exercise test on bicycle ergometer with step-wise increase in loads at regular time intervals. The bicycle ergometer provides the expression of work in watts or kg. Meters per minute.

MATERIALS AND METHOD

The present study is carried out in a group of 50 healthy, 1st year medical students of both sexes who are not regular athletes in Mahavir Institute of Medical Sciences,Vikarabad.

GROUP A:

25 males between the age group 17-19 years were selected as Group A

GROUP B:

25 females between the age group 17-19 years were selected as Group B

Inclusion criteria for the study:

1)Students who do not engage in regular or strenuous exercise

2)Normal BMI

3)no history of any acute or chronic illness

Exclusion criteria:

1) History of any acute or chronic illness

2) smokers

The subjects were all well informed about the experimental purpose and protocol and oral consent obtained. Vital capacity(VC), Respiratory minute volume(RMV), Maximum voluntary ventilation(MVV) were recorded post-exercise,

Exercise regimen: each subject exercised on a bicycle ergometer with incremental loads until the maximum is reached at exhaustion. Work output attained is calculated from a record of the number of revolutions and loads employed.work capacity was expressed in watts.

Vital capacity: was determined using wet spirometer.

Respiratory Minute Volume (RMV): also known as pulmonary ventilation per minute(PV) is amount

of air inspired or expired per minute. It is determined by collecting expired air into a Douglas bag while the subject breaths under restful conditions for one minute.

Maximum Voluntary, Ventilation (MVV): formerly known as maximum breathing capacity(M.B.C) is the maximal volume of gas that can be breathed per minute by voluntary .effort. It was recorded by asking the subject to breath as rapidly and as deeply as he can for a -15second interval. The volume of air moved out is collected in a Douglas bag and then measured by displacing it into spirometer.

Statistical analysis:

Statistical analysis was done using unpaired t test and Microsoft excel were used.

P value <0.05 was considered as statistical significant.

The results were expressed as Mean ± Standard Deviation.

FINDINGS

Table:1 – GROUP A

Statistical data	Work capacity (Watts)	Vital capacity(Litres)	Maximum voluntary ventilation(litres/minute)	Respiratory minute volume (litres/minute)
Mean	114.32	3.5	69.09	5.39
S.D	19.18	1.29	9.85	2.51
S.E	3.83	0.29	1.97	0.5

Table:2-GROUP B

Statistical data	Work capacity (Watts)	Vital capacity(Litres)	Maximum voluntary ventilation(litres/minute)	Respiratory minute volume (litres/minute)
Mean	87.24	2.5	55.38	2.99
S.D	7.81	0.44	6.42	6.62
S.E	1.56	0.69	1.28	0.19

The Var**iat**ion of Vital capacity(P=0.0006) and Maximum voluntary ventilation (P<0.0001) between Group A and Group B post exercise is statistically significant.

The Variation of Respiratory minute volume between group A and group B was not statistically significant.

DISCUSSION

For a long time it was argued that cardio vascular system was much more significant than the respiratory system as a factor limiting endurance performance. However, it was found that respiratory muscle fatigue as an important factor limiting prolonged effort, particularly in older patients with some degree of respiratory obstruction[4]. The respiratory muscle fatigue might limit endurance was critically analyzed by Cohen, demonstrating the ergogenic benefit from caffeine administration, which enhanced respiratory muscle endurance and decreased perception of respiratory effort.

The relationship between ventilatory capacities and muscular work capacity was studied extensively by several investigators. Norman L. Jones et al[5] tried to establish normal standards for various variables including

Respiratory and also predictive relationships with work output on incremental Progressive bicycle ergometric testing.

Kannel and Coworkers[6] in a large prospective Framingham study, employed vital capacity as predictor of VO_2 max and exercise capacity in subjects free of respiratory disease.

Stuart and Collins[7] comparing the Vital capacity and maximal breathing capacity (M.B.C) of physically active with Physically inactive male students found the active group to possess significantly greater mean vital capacity. This was attributed to increased development of respiratory musculature incidental to regular physical training.

The studies of Ninima V, Shephard R.J[8] did not validate a correlation between respiratory function and exercise capacity. According to them the oxygen transport system was more critically dependent on peripheral and cardiovascular capacity than on respiratory capacity.

According to Costill[9] the best index of efficiency of respiration is the volume of pulmonary ventilation required for uptake of 1 liter of oxygen rather than vital capacity perse.He also pointed out that vital capacity is not probably increased by training but volume of ventilation required in heavy work is reduced by training.

The role of other ventilatory capacities as limiting factors of exercise was analyzed by Van Meer haughe A et al[10]. Theoretically the limiting factor in delivery of oxygen might be the capacity for ventilating the lungs. They made simultaneousrecordings of respiratory minute volume (R.M.V or VE), CO2 output and 02 intake in subjects performing progressive exercise test on bicycle ergometer and found an increase in R.M.V in response to increase in ratio of VE/V02 and VE/VC02. Pulmonary ventilation (VE) was still capable of further increase even when maximal cardiac output had been reached.

CONCLUSION

There was significant increase in Vital capacity and Maximum Voluntary Ventilation in males compared to females after exercise.

Source of Funding: Self

Ethical Clearance: Taken from Scientific Ethical committee,Mahavir Institute of Medical Sciences,Vikarabad,Telangana.

Conflict of Interest – Nil

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