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Physiological Effects of Practice of Loving-Kindness Meditation

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ABSTRACT

Introduction: Meditation is described as a family of self-regulation practices that focus on training attention and awareness in order to foster general mental well-being.[1] Loving-kindness is a meditation practice taught by the Buddha to develop the mental habit of selfless or altruistic love.

Review: This article reviews the various studies on effect of Loving-kindness meditation (LKM) on various body regulatory systems and its relevance in management of stress related disorders.

Conclusion: Based on the review of previous studies it is concluded that LKM may be particularly useful for targeting psychological problems, including anger and interpersonal stress and therefore stress induced diseases.

Keywords: *Meditation, loving-kindness meditation, insula, neuroendocrine system.*

INTRODUCTION

Loving-kindness is a meditation practice taught by the Buddha to develop the mental habit of selfless or altruistic love. In the Dhammapada can be found the saying: "Hatred cannot coexist with loving-kindness, and dissipates if supplanted with thoughts based on loving-kindness."

To put it into its context, Loving-kindness is the first of a series of meditations that produce four qualities of love: Friendliness (*metta*), Compassion (*karuna*), Appreciative Joy (*mudita*) and Equanimity (*upekkha*).[1]

This article reviews the various studies on effect of Loving-kindness meditation (LKM) on various body regulatory systems and its relevance in management of stress related disorders.

EFFECT OF LOVING KINDNESS MEDITATION ON BODY'S INFLAMMATORY AND NEUROENDOCRINE SYSTEM

Neuroendocrine studies suggest that loving-kindness meditation (LKM) may reduce stress-induced subjective distress and immune response.[2, 3]

EFFECT OF LOVING KINDNESS MEDITATION ON BRAIN

To investigate the exact implication of practice of loving kindness meditation on the brain, researchers invited two groups of subjects : those who had at least 10,000 hours of loving-kindness meditation under their meditative belt and those who were interested, but new to meditation. Both these groups were subjected to the fMRI scanner to see how LKM would impact the brain. The practice of LKM changed several important brain regions: especially both the insula and the temporal parietal junction (TPJ). The insula is the part of the brain responsible for our ability to empathize with others, and to make oneself aware of emotional and physical present-moment experiences. While both groups saw an increase in insula activity, the group with 10,000 hours of experience showed significantly more activation than the other group. This group was experiencing higher levels of compassion than the non-practicing group.

A similar finding appeared for the TPJ. The TPJ, like the insula, is also related to our ability to process empathy and our ability to attune to the emotional states of others. Compared to short-term meditators, those with a long-term meditation practice showed significant activation of this brain region. Furthermore, it was found that meditation

increased activity in the amygdala, which is crucial for the processing of emotional stimuli. Moreover, neuroimaging investigations comparing expert and novice meditators indicate that LKM enhances the emotional and somatosensory brain representations of other people's emotions. [4, 5]

LOVING-KINDNESS MEDITATION CREATES FEELINGS OF SOCIAL CONNECTION

The study by Hutcherson and colleagues (2008) suggests that even a

7-minute training in LKM can produce small or moderately strong improvements in positive feelings toward strangers and the self. [6]

The Dalai Lama has been quoted as saying, "This is my simple religion. There is no need for temples; no need for complicated philosophy. Our own brain, our own heart is our temple; the philosophy is kindness."

A study by Fredrickson and colleagues (2008) investigated the question of whether a modified LKM intervention enhances a person's daily experiences of positive emotions, which, in turn, may increase personal resources that hold positive consequences for the person's mental health.[7]

The results showed that LKM led to shifts in people's daily experiences of a wide range of positive emotions, including love, joy, contentment, gratitude, pride, hope, interest, amusement, and awe. Within traditional Buddhist practice, LKM is considered particularly helpful for people who have strong tendency towards hostility or anger .[8, 9]

PRACTICE OF LOVING KINDNESS MEDITATION

The practice always begins with developing a loving acceptance of oneself. If resistance is experienced then it indicates that feelings of unworthiness are present. The practice itself is designed to overcome any feelings of self-doubt or negativity. Then one is ready to systematically develop loving-kindness towards others. According to Buddhist tradition [10], at each stage the meditation exercise consists of thinking about specific wishes (aspirations) for the other, including the following: (1) may the person be free from enmity; (2) may the person be free from mental suffering; (3) may the person be free from physical suffering; and (4) may the person take care of him/herself happily (e.g., Chalmers, 2007; The Dalai Lama, 2001. One may begin by first directing this feeling of compassion towards oneself or to others, depending upon what is easiest.

TYPES OF PERSONS TO DEVELOP LOVING-KINDNESS TOWARDS

a. Focus on Self.

b. Focus on a respected, beloved person - such as a spiritual teacher.

c. Focus on a dearly beloved - which could be a close family member or friend and who does not invoke sexual desires.

d. Focus on a neutral person - i.e., a person who typically does not elicit either particularly positive or negative feelings.

e. Focus on a hostile person – someone with whom there is a strained relationship.

f. Focus on the entire universe. [11] Starting with oneself , then systematically sending loving-kindness from person to person in the above order will have the effect of breaking down the barriers between the four types of people and oneself. This will have the effect of breaking down the divisions within one's own mind, the source of much of the conflict we experience. When the positive feelings arise it is instructed that the mind be fixed on the feeling. The second stage is Directional Pervasion where one systematically projects the aroused feeling of loving-kindness to all points of the compass: north, south, east and west, up and down, and all around. Non-specific Pervasion tends to spontaneously happen as the practice matures. It is not discriminating. It has no specific object and involves just naturally radiating feelings of universal love.

The limited empirical evidence from the intervention literature suggests that elements of LKM can be trained within a relatively short period of time. The study by Hutcherson adn colleagues (2008), in fact, suggests that even a

7-minute training in LKM can produce small or moderately strong improvements in positive feelings toward strangers and the self.

LIMITATIONS OF PREVIOUS STUDIES

It is found that mindfulness meditation is used in the various Buddhist traditions as an important preliminary phase to establish concentration and attention required for LKM. [8, 9, 11] When effects upon LKM were examined alone in an intervention trial (Fredrickson et al; 2008), effects upon positive emotions were significant but small. This may suggest that LKM techniques require integration with mindfulness practices, and future research in this area is clearly needed.

It is concluded that LKM may be particularly useful for targeting psychological problems, including anger and interpersonal stress and therefore stress induced diseases.

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Conflict of Interest – None

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Long Latency Response (LLR) of Abductor Pollicis Brevis (APB) in the Dominant and Non Dominant Hand of Healthy Adult Males

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ABSTRACT

Background : The Long latency response (LLR) is an electrical response following the H reflex, on stimulation of a mixed nerve. The LLR afferents travel in the posterior column, get relayed in the motor cortex and efferents end on alpha motor neurons via the pyramidal tract. Long latency responses test afferent sensory and efferent motor pathways travelling via the cortex. LLRs help in investigating movement disorders like Parkinson's disease, Huntington's chorea, essential tremors and idiopathic dystonias. The present study was undertaken as few Indian studies are available.

Aim : To determine the latency and amplitude of LLR of APB of the dominant and non dominant hand.

Materials and method : The subject was asked to contract the muscle APB and maintain 10% maximal isotonic contraction of APB. During contraction, LLRs from APB were elicited by electrical stimulation of the median nerve in 50 normal subjects in the age group of 25 to 35 yrs in the dominant and non dominant hand. Stimulus intensity was 3-4 mA and duration was 1 ms. LLRs were recorded using EMG/EP machine (Recorders Medicare Systems, India). 100 responses were averaged. The LLR latency and peak to peak amplitude was determined.

Result : The mean value (± SD) of LLR latency of dominant hand was 47.5ms (± 3.07) and of non dominant hand was 47ms (± 3.22). The median value, 25^{th} & 75^{th} percentile of LLR amplitude of the dominant hand was 135.90μV, (105.35, 214.35) and of non dominant hand was 108.1μV, (77.70, 169.35).

Conclusion: In healthy adults the values of LLR latency and amplitude of APB in the dominant and non dominant hand were determined. LLR latency was similar in the dominant and non dominant hands. LLR amplitude was significantly more in the dominant hand as compared to the non dominant hand.

Keywords *– long latency response, Parkinson's disease, Idiopathic dystonia, Essential tremors, Huntington's chorea*

INTRODUCTION

The Long latency response (LLR) is an electrical response following the H reflex, on stimulation of a mixed nerve. The pathway for LLR is that afferents travel in the posterior column, relay in the motor cortex and efferents end on α motor neurons via the pyramidal tract[1-3]. LLRs help in assessing afferent sensory and efferent motor pathways travelling via the cortex. It is an ideal test to measure conduction velocity within the spinal cord. LLRs help in investigating movement disorders[5] like Parkinson's disease, Huntington's chorea, Essential tremors, Idiopathic dystonias. LLRs were found to be absent in patients[5] with Huntington's disease, Spasticity,

Multiple sclerosis. Increased LLR responses are found predominantly in patients[4] with Resting and postural tremors, lesions of supplementary motor area (SMA). This present study was undertaken as very few Indian studies are available.

AIM

To determine the latency and amplitude of LLR of APB of the dominant and non dominant hand of healthy adult male volunteers

MATERIAL AND METHOD

Type of Study: Observational and Cross sectional study.

Number of Groups : One

Sample Size : 50

Period of Study : Jan 2012 – Jan 2013

Place of Study : Pondicherry Institute of Medical Sciences, Pondicherry

Inclusion Criteria: Clinically healthy normal male subjects in the age group of 25 to 35 years with no known neuromuscular and cardiovascular diseases

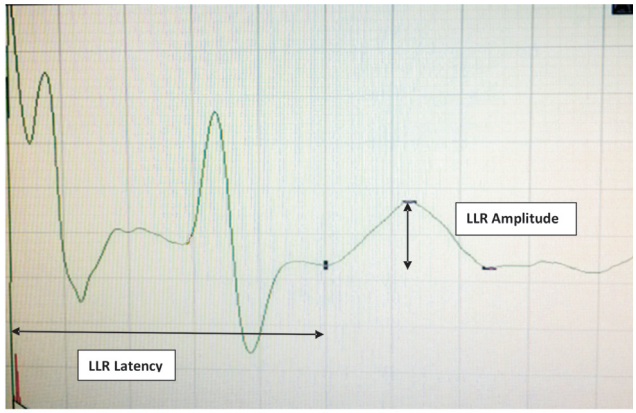
PROCEDURE

Informed written consent was obtained from the subjects. Subjects were tested at the same time each day in the electrophysiology lab, at Pondicherry Institute of Medical Sciences, Pondicherry with reduced sound and light at 22 ± 1°C. Subjects were tested at the same time each day in the electrophysiology lab. The subject was asked to lie down comfortably in the supine position. The dominant hand of the subject was identified. The subject was asked to contract the muscle abductor pollicis brevis (APB) and to maintain 10% maximal isotonic contraction of the APB. During contraction, LLRs from APB were elicited by electrical stimulation of the median nerve in the dominant and non dominant hand. Stimulus intensity was 3-4 mA and duration of 1 ms, delivered from a constant current stimulator through bipolar stimulating electrodes. Stimulus repetition rate was once in every 2 seconds. LLRs were recorded using a digitalized nerve conduction / EMG/ EP machine (Aleron Recorders Medicare Systems, Chandigarh, India). 100 responses were averaged (fig.1). The LLR latency and amplitude of the abductor pollicis brevis muscle (APB) were obtained. The LLR latency was measured from the stimulus artefact to the 1st deflection from the baseline, after the H reflex. The peak to peak amplitude of this waveform gave the LLR amplitude.

RESULTS

The mean value (±SD) of LLR latency in the dominant hand was found to be 47.5ms (±3.07) and in the non dominant hand it was found to be 47ms (±3.22). The median value, 25th & 75th percentile of LLR amplitude of dominant hand were 135.90μV, (105.35μV, 214.35 μV) and of non dominant hand were 108.1μV, (77.70 μV, 169.35 μV). The LLR latency of the dominant hand and non-dominant hand were statistically similar. The LLR amplitude of the dominant hand was significantly more than the non-dominant hand.

Fig. 1. A typical recording of Long Latency Response (LLR) in healthy adult males . Calibration is x-axis: 10ms/div and Y –axis: 100 μV/div**.**



DISCUSSION

In a study done by Marcus Naumann et al[6] in 1997 on the long latency reflexes of hand muscles in idiopathic focal dystonia and their modification by botulinum toxin, the long latency reflexes were elicited in thenar muscles by median nerve stimulation in 20 healthy control subjects and 34 patients with idiopathic focal dystonia. It was said that LLRs were obtained bilaterally in all the controls with a latency of 50ms. The LLR latency values of our study were similar to those reported.

CONCLUSION

The LLR latency and amplitude of APB were determined in healthy adult males.

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Conflict of Interest : Nil

Source of Funding : Nil

Ethical Clearance : Nil

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Effect of Acute Psychological Stress on Blood Pressure

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ABSTRACT

Background: Medical training is perceived as being stressful with negative consequences on student's Mental and physical health resulting in depression, poor academic performance and stress responses. Especially First year MBBS students are in great stress as they are in the transition phase of their life. Medical students face many stresses in their academic life out of which examinations is a major psychological stressor. Majority of previous studies indicate that psychosocial stress contributes to hypertension and cardiovascular disease (CVD).

Whereas some reviews have only weak or inconsistent evidence, concluding acute psychosocial stress is probably not a risk factor for hypertension.

Objective: Hence this study was done to evaluate perceived stress during academic examination and it's Correlation with cardiovascular reactivity.

Study Design: In this study, we analyzed the results of the Perceived Stress Score (PSS) and the blood pressure variations and whether these changes was affected by sex, age, among first year medical students one month before and during examination.

Materials and Method: One hundred and fifty (100 males and 50 females) first year medical students were given the PSS questionnaire one month before and immediately after the examinations. Their blood pressure was also recorded on both the occasions by mercury sphygmomanometer.

Results: Statistically we found that all the medical students had higher values of PSS score both before and during the examination period and significantly increased during exams (P value-0.040). There was also significant increase in systolic and diastolic blood pressure during the examination.

Conclusion: The results cover a significant correlation of academic examinations to psychological stress and cardiovascular reactivity.

Keywords: *First year MBBS students, Perceived stress score, Blood pressure*

INTRODUCTION

Stress can be defined as 'any challenge to homoeostasis'. It can manifest itself either as eustress or as distress. Eustress, literally translated as 'good stress', is a positive form of stress that motivates an individual to continue working. It is when this stress is no longer tolerable and/or manageable that distress manifests. Distress, or 'bad stress', is the point at which the good stress becomes too much to bear or cope with and leads to multiorgan physiological dysregulation including cardiovascular reactivity.[1]

Medical education is challenging and stressful for students [2,3],with common stress factors they come across are high parental expectations , vast syllabus, worry about future, long duration of course, frequency of examinations, lack of sleep and lack of emotional and social support.

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Academic examination stresses are the most common cause for occurrence of autonomic, cardiovascular, and immune system pathology among the college students which leads to mental and physical illness such as increasing nervousness, increasing depressing mood and suicidal thoughts [4,5,6].High psychological stress is associated with high blood pressure, higher BMI, larger waist to hip ratio, shorter telomere length, higher cortisol levels, suppressed immune function, decreased sleep, and increased alcohol consumption.[7] These are all important risk factors for cardiovascular diseases.[8,9,10].

Previous studies have shown that academic examinations produce stress responses. But there is considerable variability and some studies have revealed that the examinations in medical education need not be considered as detrimental stress. Moderate stress in young adults could be beneficial for long term success. Therefore, the examination stress may be categorized as 'eustress'[11].Some studies have concluded in their study that acute psychosocial stress is probably not a risk factor for hypertension.[12]

We undertook this study to assess the effects of academic stress by using the Perceived Stress Score (PSS scale) [9] and also its effect on the blood pressure before and immediately after examinations in medical students. Hence the aim of this cross-sectional study was to determine the prevalence of psychological morbidity among medical students during examinations and its effect on cardiovascular reactivity. It was hoped that the study could contribute to the existing literature on the topic and provide information for possible future interventions.

MATERIALS AND METHOD

Subjects: A cross-sectional study was conducted on a cohort of one hundred and fifty male and female, first-year MBBS medical students. The time of the study was between 10 am and 12 Noon. The students who were selected for this study were from Bangalore Medical college, a well known Institute in south India which had an annual admission of 250 students. Out of them, 100 boys and 50 girls (randomly) were requested to participate in this study. The data was taken both in the pre-examination (one month before the examination) and later in the post-examination period (same day after the examination). Informed consent was taken from the subjects. A clearance was obtained from the institutional ethical committee before the start of this study.

INCLUSION CRITERIA

1. Healthy students 2. Age group between 17 and 21 years 3. First year MBBS Exclusion Criteria:

1. History of illness in the recent past 2. Any recent family history distress.

Parameters which were studied Perceived stress scale questionnaire: -10 item perceived stress scale, previously validated and utilized by several successful investigators researching student's stress levels, was employed. The Perceived Stress Scale is a 10-item self-report questionnaire that measures the persons' evaluation of the stressfulness of the situations in the past one month of their lives. The Perceived Stress Scale is the only empirically established index of general stress appraisal. In the present study, the students were explained about the PSS scale questionnaire in detail and were told to tick the appropriate numbers. Later, the total score was assessed.For each question, they had to choose from the following alternatives: 0 - never , 1 - almost never , 2 - sometimes , 3 - fairly often and 4 - very often
Assessing the PSS score:
The PSS score was determined by the following method: First, by reversing the scores for questions 4, 5, 7 and 8. On these 4 questions, the scores could change from: 0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0. Then, the scores were added up for each item to get the total.

The total score was represented as the stress score: The individual scores on the PSS could range from 0 to 40, which were grouped into 3 groups. Scores ranging from 0-13 groped under low stress. Scores ranging from 14-26 grouped under moderate stress. Scores ranging from 27-40 grouped under high perceived stress.

MEASUREMENT OF BLOOD PRESSURE

The subjects were made to relax for 10 minutes before the measurement. The blood pressure was measured by using a standard sphygmomanometer. Both the systolic and diastolic BP were measured with the students in the supine position and they were recorded one month before and immediately after the examinations. The blood pressure was compared

before and after the examinations in all the subjects.

Statistics: The statistical analysis was done by using the Student's unpaired 't' test.

Statistical software: The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1 ,Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

On statistically analysing the results of our study we found that all the medical students had higher values of PSS score both before and during the examination period and significantly increased during exams (P value-0.040).Table 2

The number of students in the moderate stress group was the highest (89.3%) before the examination and in the high stressed group; it was (9.3%). But in the post examination period, the moderate stress group had only (72%) students, while the highly stressed group showed an increase in the number of students to (20%). Table1

There was also increase in systolic and diastolic blood pressure during the examination,

Significantly in females as compared to males.Table3,Table 4

Table 1: PSS score

PSS	Gender		Total (n=150)
	Male (n=100)	Female (n=50)	
Before Examination			
• Low perceived stress	1(1%)	1(2%)	2(1.3%)
• Moderate perceived stress	92(92%)	42(84%)	134(89.3%)
• High perceived stress	7(7%)	7(14%)	14(9.3%)
During examination			
• Low perceived stress	8(8%)	4(8%)	12(8%)
• Moderate perceived stress	77(77%)	31(62%)	108(72%)
• High perceived stress	15(15%)	15(30%)	30(20%)

Table 2: PSS : A comparative evaluation

PSS	Before examination	During examination	difference	t value	P value
Male	21.15±4.10	21.54±5.77	0.390	1.256	0.212
Female	21.82±4.27	23.62±5.87	1.800	4.749	<0.001**
P value	0.354	0.040*	-	-	-

Table 3: SBP (mm Hg)

SBP (mm Hg)	Before examination	During examination	difference	t value	P value
Male	105.02±8.12	114.24±7.80	9.220	22.604	<0.001**
Female	106.80±6.21	113.92±7.08	7.120	15.319	<0.001**
P value	0.175	0.807	-	-	-

Table 4: DBP (mm Hg): A comparative evaluation

DBP (mm Hg)	Before examination	During examination	difference	t value	P value
Male	66.86±5.20	74.82±5.42	7.960	21.108	<0.001**
Female	67.68±5.37	73.36±6.12	5.680	13.608	<0.001**
P value	0.369	0.139	-	-	-

DISCUSSION

"Stress", this term was coined for the first time by Hans Selye in 1935 [13]. Stress is a "multidimensional concept" made up of at least three components: (i) the stimulus, or stressor ; (ii) the cognitive evaluation of the stressor ; (iii) the resulting physiological responses of the individual. This third component refers to Selye's characterization of the stress response as a "general adaptation syndrome", organized into three stages [14]. The first stage is the general alarm reaction, during which numerous biological systems are activated in response to the stressor. The second stage would lead to resistance, with the activated biological systems returning to normal. If the stressful stimulus is prolonged, the organism loses its resistance and enters a phase of exhaustion, regarded as the third stage of the syndrome.

The consequences of physiological activation are many: mobilization of energy (such as free fatty acids, glycerol, glucose, amino acids) from storage nutrients (triglycerides, glycogens, proteins) and ceasing further energy storage, increase in cardiovascular/ pulmonary tone to facilitate tissue delivery of oxygen and glucose, slowing down of anabolic processes until the acute emergency has passed, and suppression of digestion, growth, reproduction, inflammatory responses and immunity [15].

Acute stress responses are triggered through the sympathetic nervous system and the hypothalamic-pituitary-adrenocortical axis and increase cardiac output, heart rate, and peripheral resistance [16]. Symphathetic stress response especially to emotional or psychological stress increases blood pressure. [17]

Previous studies have shown that large increases in blood pressure (BP) during psychological stress are at risk for developing essential hypertension in future. [18]

Our body produces a surge of hormones when we are in a stressful situation. These hormones temporarily increase your blood pressure by causing increase in heart rate and vasoconstriction. However, short-term stress-related spikes in our blood pressure added up over time may put you at risk of developing long-term high blood pressure.

Our results were in concurrent with other studies where there was increase in both systolic and diastolic blood pressure during academic examination stress significantly in females as compared to males [19,20]. Bazmi Inam [21] has noted prevalence of increase anxiety in females to be 89.7% and males 60% in 1st year medical students of Saudi Arabia. Similar findings were noted from other studies conducted at western medical school as well as other Asian and African medical schools using different screening tools.[22,23,24]

Janet Di Pietro et al [25,] argued that there was a wrong perception that stress was always harmful. The author suggested that most of the people do their best under mild to moderate stress. Therefore, some amount of stress could produce positive effects, as was suggested by Spencer Rathus [26] in 'Psychology: Concepts and Connections', where he argued that stress was necessary to keep us alert and occupied. Posttraumatic growth is a positive outcome of stress, leading to beneficial effects and there is a biochemical and scientific bias that stress is bad, but anecdotally and clinically, it is quiet evident that it can do good for some people.

LIMITATIONS OF THE STUDY

One of the limitations of this study is that the data of this study are based on the self reported information which was provided by the students and some potential for reporting bias may have occurred, as the ability of the students to understand the questions may have varied.

In conclusion, Medical students perceived a level of stress both before and during Examination and that was higher during than before the academic examination.

Both systolic and diastolic blood pressures were significantly increased during examinations. The results cover a significant correlation of academic examinations to psychological stress and cardiovascular reactivity

From the present study, we reiterate that academic examinations could produce stress responses. Medical education system needs to advance and look out for alternative academic student evaluation techniques which cause less stress among students.

The medical students and teaching faculty should be educated regarding the negative consequences of stress faced and an effective stress relaxation program as well as counselling services should be provided to such stressed students for their well being. Stress relaxation techniques like meditation, yoga, sports and cultural activities can be recommended to reduce stress.

Results point to the relevance of control of psychological stress for the non-therapeutic management of high blood pressure. Further research investigating the role of stress in hypertension pathogenesis should be conducted.

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Gender Difference Regarding Anxiety and Depression among Patients of Type-2 Diabetes Mellitus of Bangalore Population

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ABSTRACT

Background: Type 2 diabetes mellitus doubles the odds of suffering from depressive illness. Co-morbid depression is associated with poorer outcomes in diabetes mellitus in terms of glycemic control, medication adherence, physical activity and quality of life. It has also been observed that the prevalence of depression was higher in females with diabetes compared with males.

Objectives: Aim of the present study was to explore whether females with type-2 diabetes are affected by anxiety and depression more compared to their male counterparts.

Materials and Method: Forty eight patients with type-2 diabetes have participated in this study. Hospital Anxiety and Depression Scale (HADS) was used to score the anxiety and depression among the study subjects. Pearson's correlation coefficient was calculated to find out the correlation between different diabetes-related parameters and the scores on HADS-Anxiety and HADS Depression scale.

Results: The mean age of the study subjects was 53.16±6.4 yrs. The study sample comprised of 31.25% females (n = 15) and 68.75% males (n = 33). The mean duration of type 2 diabetes among the subjects was 11.9(SD ±6.2) years, HADS was 14.7(SD±5.6) and the mean HbA1C was 9.59% (SD ± 2.2). We observed that women presented higher percentages of anxiety in comparison to men.

Conclusions: Patients with type-2 diabetes mellitus are more susceptible to depression and anxiety and they are positively correlated with the levels of HbA1c and also with the duration of the disease. Our study also revealed significantly higher anxiety scores among women patients.

Keywords: *anxiety, depression, type-2 diabetes mellitus*

INTRODUCTION

Depression has been bi-directionally associated with diabetes mellitus.[1]

Patients suffering from diabetes mellitus are also at a higher risk of being diagnosed with depression compared to normal population. This prevalence of depression among subjects with diabetes mellitus ranges from 12% to 28% in various studies.[2–6] A large meta-analysis by Andersen *et al.* in 2001 incorporating data from 42 studies concluded that the presence of diabetes doubles the odds of having co-morbid depression.[7]

In addition to the morbidity associated with the disease itself, the presence of depression complicates outcomes in the management of diabetes mellitus. Patients with co-morbid depression are more likely to have poor control of hyperglycemia in both type 1 and 2 diabetes mellitus.[9] Depression is also associated with

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poor adherence to diabetic medications and dietary regimes. There is also lesser physical activity, reduced quality of life, and increased heath care expenditure in patients with diabetes and depression.[8–11]

A systematic review and meta-analysis indicated that the prevalence of depression was higher in females with diabetes (23.8%) compared with males (12.8%). [12]

Therefore aim of the present study was to explore whether females with type-2 diabetes are affected by anxiety and depression more compared to their male counterparts.

MATERIALS AND METHOD

The study was conducted in the diabetology outpatient department of Victoria Hospital, Bangalore Medical College & Research institute. Making use of a cross-sectional study design, data was collected from the consecutive patients receiving treatment from the outpatient department for their type 2 diabetes mellitus. Only those subjects giving valid informed consent were included in the study which came up to 48 consecutive patients with type-2 diabetes. The instruments used included a semi-structured questionnaire to collect the sociodemographic profile and the details of the diabetes and their treatment. The details regarding the diabetes included the duration of the condition, duration of treatment, type of treatment being received and complications due to diabetes. The level of diabetes control was assessed using the HbA1c levels. Hospital Anxiety and Depression Scale (HADS) was used to score the anxiety and depression among the study subjects. Use of HADS has been recommended for assessment of anxiety and depression in those with type 2 diabetes.[13] It is a validated and standardized instrument with good sensitivity and specificity.[14] It has been used in various previous studies on this issue and it allowed us to make comparisons with the previous findings. The HADS comprises statements which the patient rates based on their experience over the past week. The 14 statements are relevant to either generalized anxiety (seven statements) or depression (seven statements). Each question has four possible responses. Responses are scored on a scale from 3 to 0.

Analysis was carried out using the SPSS version 16.0. Descriptive statistics were carried out for different sociodemographic- and diabetes-related parameters. In between group difference were calculated for male and female study subjects using independent sample t test. Pearson's correlation coefficient was calculated to find out the correlation between different diabetes-related parameters and the scores on HADS-Anxiety and HADS Depression scale. The level of significance for all the statistical tests was kept at $P<0.05$.

RESULTS

PARAMETERS	Male	Female	p value
AGE	54.75±6.56	49.6±4.4*	0.009*
DURATION	11.75±6.86	12.2±.41	0.79
HbA1C	9.47±2.27	9.8±2.05	0.58
HADS	13.3±4.9	17.7±5.9*	0.0011*
HADS -A	8±3.2	11.6±3.9	0.001
HADS-D	5.2±2.3	6±3.1	0.3
Correlation bet HbA1C & HADS	0.02981	0.31	0.001*
Correlation bet Duration & HADS	0.32	0.32	0.02*

The study included 48 consecutive subjects with type 2 diabetes visiting the outpatient department. The mean age of the study subjects was 53.16±6.4 yrs. The study sample comprised of 31.25% females (n = 15) and 68.75% males (n = 33). The mean duration of type 2 diabetes among the subjects was 11.9(SD ±6.2) years, HADS was 14.7(SD±5.6) and the mean HbA1C was 9.59% (SD ± 2.2). We observe that women presented higher percentages of anxiety in comparison to men.

DISCUSSION

Following diabetic problems such as type 2 diabetes, some psychological disorders such as anxiety and depression are very common and have a high prevalence among patients. In this study, we have focused on the prevalence of depression and anxiety in patients with type 2 diabetes.

Our study revealed positive correlation between levels of HbA1C and duration of the disease with anxiety and depression. In our study, there was significantly higher anxiety scores in female patients compared to their male counterparts. This is in concurrence with the results of several previous studies

Many factors are linked to both Type 2 diabetes mellitus (T2DM) and depression that could be divided to internal factors such as inflammation hormonal status and level of serotonin, and external factors including the occupational status, level of education and gender. It has been observed that inflammation has been associated with the pathogenesis and pathophysiology of both depression and type 2 diabetes mellitus independently, however it has been suggested that depression and T2DM may have common inflammatory mechanisms. An increase in diabetes related inflammatory markers, hyperglycemia and possibly hyperinsulinemia contribute to a net pro-inflammatory state in various tissues. Access of pro-inflammatory mediators to the CNS may then lead to a stimulation of the pathways leading to the progress of depressive symptoms [15]. Moreover, T2DM is associated with reduced size of the brain area which would be led to depression such as the hippocampus and amygdala, providing strong evidences for the suggestion that T2DM does provide a true biological risk factor for depression [15].Under stress the body produces hormones, adrenaline being the one we have all heard of and it is often called the fight and flight hormone. These hormones cause the body to release stored glucose and fat for the extra energy that is required to deal with the stress, but they can only be used providing the body has enough insulin. It is this sudden extra production of glucose in people with diabetes that causes the blood sugars to rise. In this paper, in addition to other studies, the majority of patients had shown the symptoms of depression and anxiety and the results were concluded by using Hospital Anxiety and Depression Scale questionnaire.

The results of this study, in alignment with the reported results by Keita, showed that the prevalence of depression and anxiety were higher among women than men. It is known that depression is 2 folds higher in women than men. This statistics has also been observed among women with diabetes. There are some biological and socioeconomic factors that clarify the reason of higher depression and anxiety of female group such as hormonal changes during pregnancy, postpartum and premenopausal periods, Genetic vulnerability and being dependent to others [16].

Integrated Cognitive Model of Depression

The integrated cognitive model of depression postulates that the interaction between negative life events (e.g., physical and/or sexual abuse, unrelenting poverty, and discrimination) and negative cognitive style (e.g., excessive dependency on others, being a ruminator), genetic vulnerability, hormonal changes, and hypothalamic-pituitary-adrenal axis dysregulation could independently contribute to women's higher rates of depression [17,18]. However, these factors are likely to interact in complex ways to produce depression, particularly in women.

CONCLUSION

The results of our study indicate that patients with type-2 diabetes mellitus are more susceptible to depression and anxiety and they are positively correlated with the levels of HbA1c and also with the duration of the diseases. Our study also revealed significantly higher anxiety scores among women patients. The results of our study are in alignment with the findings of several previous studies.

Identification and treatment of depression represent challenges and unmet needs in medicine particularly in women. Therefore, it should be considered in the treatment of the diabetic patients since it can affect their treatment process as well as their quality of life and a little more emphatic importance should be given to women patients. The above approach could significantly decrease health care expenditure in patients with diabetes and depression.

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Correlation of Maternal Factors with Birth Weight of Neonates of Odisha

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ABSTRACT

Introduction- Low birth weight has an adverse effect on the perinatal life and even beyond. Several maternal factors have a definite contribution to the birth weight of a neonate. This prospective study was undertaken in Odisha, where low birth weight is highly prevalent; to study how various factors modulates the birth weight. **Method-** 672 pregnant women were followed up till their delivery. Blood pressure, weight, hemoglobin concentration were documented along with age, weight and birth order during the first routine ante-natal check-up. At time of parturition, the gestational age and weight of neonate was recorded and appropriate statistical analysis was applied. **Results-** Maternal hemoglobin and blood pressures contribute substantially to birth weight along with birth order and gestational age. There is better correlation among low birth weight males as compared to females and normal weight. **Conclusion-** The prediction equations can be used during ante-natal checkup to undertake necessary interventions.

Keywords *– Maternal age, Hemoglobin, Birth order, Gestational age, Birth weight*

INTRODUCTION

Longevity and health is influenced by events in the early life of an individual [(1)]. The period of intrauterine growth and development is the vital phase of a person's life cycle which determines the birth weight and is a predictor of infant growth and survival, and is dependent on various maternal factors during pregnancy. In developing countries, including India, a significant number of neonates are born with low birth weight (LBW) which includes intra-uterine growth retardation (IUGR) and pre-maturity [(2)]. Low birth weight leads to impaired growth of the newborn with its attendant risks of a higher mortality rate, increased morbidity, impaired mental development, and the risk of chronic adult disease [(2)]. Lower the birth weight, higher is the risk of neonatal and infant mortality. LBW is a strong predictor for size in later life because IUGR infants seldom attain normal size during childhood [(2)]. According to the in-utero fetal programming hypothesis (Barker hypothesis), size at birth is related to the risk of developing disease later in life [(3)]. Although the Barker hypothesis originally focused on low birth weight, there is evidence that high birth weight may have its own set of complications later in life such as hypertension, diabetes mellitus, etc [(3).] Studies have shown link between maternal obesity and obesity in later life of the child [(4)].

The causes of low birth weight are complex and interdependent, and various maternal factors are known to influence the birth weight of neonates. Maternal age, anthropometric parameters such as height, weight, body mass index (BMI), weight gain during pregnancy, nutritional status, socioeconomic status, parity etc are some of the well-established determinants of the birth weight of the neonate [(5)].

Many studies have proved the relationship between different maternal factors and birth weight, but studies pertaining to how much influence does each factor has on birth weight are scantily

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documented, especially in eastern region of India. Odisha is considered to be in the belt of states where low birth weight is highly prevalent [6]. The purpose of this study is to determine how each maternal factor influences the birth weight of newborn by generating prediction equations. Maternal age, weight, blood pressure, hemoglobin concentration, gestational age and parity were the various parameters considered in this study.

MATERIALS AND METHOD

Ethical approval was obtained from the Institutional Ethics Committee of Kalinga Institute of Medical Sciences before starting the research work. The study protocol and the rationale for the study were explained carefully in appropriate language, with questions answered as needed and written informed consent was obtained from all participants volunteering for the study. After the delivery of their babies, another written informed consent was also obtained for the participation of their babies in the study. A prospective observational study was designed for in-depth study of pregnancy cases being reported to the Department of Obstetrics and Gynecology, Pradyumna Bal Memorial Hospital, Bhubaneswar, Odisha which was followed up till the delivery of newborn. The study was conducted from December 2011 till May 2013 at Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha with collaboration of Department of Obstetrics and Gynecology and Department of Pediatrics. This is a super-specialty hospital with 20-bedded neonatal intensive care unit.

Healthy women aged 18 - 36years presenting for antenatal check up were followed up till their delivery. Age at conception, birth order, blood pressure, weight, and hemoglobin concentration were recorded at the first ante-natal visit. Standard procedures were followed for the recording of blood pressure and weight. Hemoglobin was estimated by Sahli's method of Hemoglobin estimation. The subjects were subsequently followed in the next ante-natal visits for any complications in their present pregnancy.

Subjects with preeclampsia, gestational diabetes mellitus during the present or any previous pregnancy were excluded from the study. History of recurrent abortions, chronic diseases such as congenital heart diseases, chronic kidney disease, chronic liver diseases, psychiatric illness, neurologic disorders, HIV infection, Hepatitis B infection, malignancies, ante-partum hemorrhage, premature rupture of membrane, polyhydramnious, uterine anomalies, cervical incompetence, genital tract infections, multiple pregnancies, congenital malformations, myocardial infarction, thrombosis, thrombophilia, placenta previa, etc which could influence birth weight of the neonate were excluded from the study. Pregnant women with history of drug intake such as anti-hypertensives, thyroid hormone, etc that might adversely affect the birth weight were not included in the study. Subjects with history of smoking, tobacco exposure, alcohol consumption, cocaine, heroin, other drug intake were also excluded from the study.

The gestational age at time of parturition and neonate's birth weight was recorded on a electronic weighing scale recordable upto 1gram difference and accordingly the neonates were grouped as low birth weight (<2,500gm) and normal birth weight (2,500-4,000gm). Of the 967 cases documented, 189 cases were lost during subsequent follow up or did not turn up at the institute for delivery. Another 101 cases were excluded from the study due to complications in present pregnancy or due to previous pregnancy. In 5 cases, the outcome was still birth or dead baby and hence excluded from the study. Thus the study was conducted taking 672 healthy subjects with normal pregnancy and normal outcome. Appropriate statistical analysis was done to study the correlation of each factor on the different groups of neonates. Predictive equations were formulated for estimation of birth weight from the maternal factors considered. For all statistical purposes, p-value <0.05 is considered statistically significant.

RESULTS

Of the 672 cases, 58% were primigravida at the time of pregnancy, for 25% it was their second pregnancy, 14.7% had conceived for third time, 4 cases had conceived for fourth time while just one case was reported to have conceived for fifth time. The mean values of the maternal factors in consideration are tabulated in Table -1.

TABLE-1 Mean values of maternal factors.

	Mean	SEM	SD
Maternal age (in yrs)	26.11	0.269	4.025
Maternal weight (in kg)	61.29	0.659	9.856
Maternal Hb% (in gm%)	10.72	0.102	1.540
Systolic BP(mm Hg)	121.19	0.706	10.568
Diastolic BP(mm Hg)	77.89	0.602	9.280

SEM= Standard Error of Mean, SD = Standard Deviation

The mean birth weight of the neonates was obtained as 2.694 ±0.432 gm (Mean ±SD). The mean gestational age was 37weeks 1day. Of the 672 babies born, 45.5% were males and 54.5% were females. Table 2 shows the correlation between maternal factors and birth weight of males and females newborn in low birth weight neonates while Table-3 depicts those for normal weight neonates. Strongest correlation was seen between birth weight with that of birth order and gestational age though birth order had a negative correlation.

TABLE-2 Correlation of birth weight of neonate with Maternal factors in low birth weight new-borns.

Birth weight vs	MALES		FEMALES	
	r value	p value	r value	p value
Maternal age	-0.671	<0.001**	-0.623	<0.001**
Maternal weight	0.573	<0.001**	0.522	<0.001**
Maternal Hb%	0.629	<0.001**	0.609	<0.001**
Maternal SBP	0.645	<0.001**	0.564	<0.001**
Maternal DBP	0.701	<0.001**	0.682	<0.001**
Birth Order	-0.850	<0.001**	-0.849	<0.001**
Gestational age	0.856	<0.001**	0.829	<0.001**

r= correlation coefficient, ** = highly statistically significant

TABLE-3 Correlation of birth weight of neonate with Maternal factors in normal birth weight new-borns.

Birth weight vs	MALES		FEMALES	
	r value	p value	r value	p value
Maternal age	-0.645	<0.001**	-0.612	<0.001**
Maternal weight	0.511	<0.001**	0.476	<0.001**
Maternal Hb%	0.629	<0.001**	0.609	<0.001**
Maternal SBP	0.586	<0.001**	0.502	<0.001**
Maternal DBP	0.689	<0.001**	0.645	<0.001**
Birth Order	-0.810	<0.001**	-0.799	<0.001**
Gestational age	0.749	<0.001**	0.726	<0.001**

r= correlation coefficient, ** = highly statistically significant

It was seen that the LBW males had stronger association with maternal factors as compared to the LBW females.

Among LWB and normal weight neonates, the LBW neonates had stronger association with the maternal factors. Comparing between males and females, male neonates correlated better than females in both LBW and normal weight.

The prediction equation for birth weight of neonates can be determined using maternal factors such as age, weight, hemoglobin concentration and blood pressure as shown in Table -4. Table-5 compares the calculated predictive value obtained using regression equation and the observed value of neonatal birth weight as obtained in the study.

TABLE- 4 Adjusted predictive equations for birth weight of neonates

Regression equation	r	R^2	Adj r^2	SEE	F	Sig
Birth Weight= 2.023+0.016A+0.006W+0.024H+0.001SBP+ 0.003DBP	0.854	0.729	0.728	0.309	3.074	0.007*

r= correlation coefficient, SEE= Standard error of Estimate, *= statistically significant, A= maternal age, W= Maternal weight, H= maternal Hb%, SBP= systolic BP, DBP= diastolic BP

TABLE-5 Predicted Value of birth weight applying regression equation and Observed Value of birth weight

	Predicted Value	Observed Value
Birth Weight (in kg)	2.585	2.694

DISCUSSION

Birth weight is now widely used as an indicator of health status of individual and population as it has strong associations with both child and adult health [7], being associated with childhood growth, cognition[8] and disability [9]. The prevalence of low birth weight in this study was 29.9% and anemia was reportedly detected in 26.3% of pregnant women. With increasing maternal age, the birth weight decreased significantly. This is consistent with previous studies [10], however some studies showed increasing birth weight as maternal age advanced [11, 12].

Male babies had birth weight more in proportion to increasing maternal weight as compared to females. This can be explained by the fact that males may be more responsive to growth promoting influences and more susceptible to supply disturbances [13,14]. Low maternal hemoglobin concentration was associated with low birth weight babies in our study as suggested by other studies also [15]. Low plasma volumes due to hemoconcentration might be the possible etiology for poor perinatal outcome, presumably though reduced uterine perfusion [16].

Previous studies have shown maternal hypertension associated with low birth weight [9, 17]. Maternal hypertension is thought to cause LBW by affecting placental blood flow thus limiting nutrient supply. Although we considered only normotensives in our study, diastolic blood pressure had stronger association to birth weight as compared to systolic blood pressure.

Most of the infants with low birth weight were born to multiparous and grand multiparous women similar to previous studies [18, 19] showing that as the birth order increases beyond the third pregnancy, the birth weight tends to drop especially if the spacing is poor. Besides, multiparity and higher number of births is a common feature seen in women of low socioeconomic status a factor associated with low birth weight [9, 20-23].

Our findings suggest a possible multi-factorial cause for low birth weight influenced by various maternal factors working together [24]. Therefore by the predictive equation obtained by multiple regression, we can, to some extent predict the birth weight of the baby at the time of the first antenatal check up and like-wise advise the pregnant women, having risk of low birth weight babies, regarding proper nutrition and emphasis on iron supplementations. The study being undertaken in a super-specialty setting, it can be assumed that maternal socio-economic and educational status influence on the birth weight is negligible.

CONCLUSION

Although the sample size should not be a limiting factor for commenting on the fact that prevalence of low birth weight is showing a gradual declining trend in Odisha with better socio-economic status and higher maternal educational qualification. Perinatal period greatly impacts and affects the future physical and mental health of an individual. This, in turn is depending on various pre-conception maternal factors. Simple awareness is required in general population for improving birth weight of new-born and future development of an individual.

CONFLICT OF INTEREST – Conflict of Interest declared none.

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Auditory Acuity as a Reflection of Dyslipidemia

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ABSTRACT

Background: Communication is a crucial aspect of human life and auditory sense is very important for communication of any kind. Dyslipidemia, being a silent disease has been hypothesized as an independent risk factor for hearing loss due to atherosclerotic changes in vessel wall leading to vascular obstruction and end organ hypoxia. Cochlea, whose blood supply is by an end artery, is highly sensitive to these changes.

Objectives : A)To perform Pure Tone Audiometry and compare hearing frequencies between cases and controls.

B) To assess lipid levels among different degrees of hearing loss

Methodology: A Case control study was done. 30 cases with abnormal serum lipid levels, 30 controls with normal serum lipid levels of age 30-50 yrs were selected after appropriate inclusion-exclusion criteria. Informed consent was taken. Serum lipid levels were assessed. Audiometric test for hearing acuity using ASHA 2005 guidelines was done in all subjects. Results were compiled and statistically analysed.

Results: Cases were found to have sensorineural hearing loss compared to controls in the hearing frequency of 500- 4000Hz ($p<0.001$). Serum levels of Total cholesterol and triglycerides showed no significant relationship among different degree of sensorineural hearing loss. Significant rise in LDL and decrease in HDL was found as sensorineural hearing loss increased from mild to severe degree ($p<0.01$). Degree of hearing loss increased with increasing duration of dyslipidemia.

Conclusion: Dyslipidemic subjects were found to have sensorineural hearing loss. Low density lipoprotein levels directly correlate whereas high density lipoproteins negatively correlate with severity of sensorineural hearing loss. Reduced auditory acuity does reflect about severity and duration of dyslipidemia.

Keywords*: Dyslipidemia, Sensorineural hearing loss, LDL, HDL.*

INTRODUCTION

Hearing loss is the most common sensory disorder affecting most of the world population. 5 million of the world population have profound degree of hearing impairment. 360 million worldwide have disabling hearing loss of at least 40 db. 200 million have varying degree of hearing loss [1].

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Helen Keller once said, "Deafness cuts one off from people, whereas blindness cuts one off from things". Hearing Loss has significant individual impact and substantially affects social, economic development in the country. Half of all the cases of hearing loss are avoidable through PRIMARY PREVENTION.

Dyslipidemia, a silent disease brings about atherosclerotic changes in vessel wall leading to vascular obstruction and end organ hypoxia. Cochlea supplied by an end artery is highly sensitive to these

changes. The increase in blood viscosity reduces capillary blood flow and ends up reducing oxygen transport. This causes tissue hypoxia, thus causing hearing complaints and hearing loss in patients [2].

Research to find association between dyslipidemia and hearing loss is limited as the relationship is unclear. In 1964, Rosen et al. were the first to publish a report raising the possibility that dyslipidemia was associated with reduced hearing. They conducted several epidemiologic studies in different areas of the world and suggested that diet is an important factor for prevention of coronary artery disease and hearing loss. There have also been several other studies conducted that suggest a relationship between hyperlipidemia and hearing loss, especially presbycusis and noise-induced hearing loss. Others describe a relationship between specific lipid fractions and hearing disturbances. In addition, a few reports have been published that not only describe a relationship between dyslipidemia and hearing loss, but suggest that the hearing loss is potentially reversible if dietary measures to reduce cholesterol are instituted.

Conversely, there have been several reports that call into question the relationship between dyslipidemia and auditory function. In a retrospective review of 100 patients with hearing loss, Lowry and Isaacson found a lower prevalence of hyperlipidemia in their subjects than would be expected in the general population. In addition, other studies have concluded that there may not be a significant relationship between increased blood lipids and hearing loss [3].

This study is undertaken to identify the role of dyslipidemia in auditory acuity. The other hypothesis tested is to settle this conflict of dyslipidemia alone reducing the auditory acuity, excluding noise induced hearing impairment. Thus the present study is undertaken to identify the likely association between hearing loss and dyslipidemia.

OBJECTIVES

- To perform Pure Tone Audiometry and compare auditory thresholds between cases and controls.
- To assess lipid levels among different degrees of hearing loss

MATERIALS AND METHOD

A Case control study was done. 30 subjects with elevated serum lipid levels (TCL >200 mg/dl, TG >150 mg/dl, LDL>100 mg/dl, HDL<40 mg/dl) as cases and 30 healthy subjects as controls in age group of 20-50 yrs, BMI< 24 were selected [4, 5]. Study was approved by ethical committee. Written informed consent was taken and general physical examination done. Questionnaire was administered to rule out exclusion criteria like age > 50 yrs, diabetes, hypertension, any systemic illness , taking ototoxic medications, smoking, alcohol, family history of hearing loss, working or residing in loud noisy environment; previous ear, head and neck infections, tumours or surgeries, head injury, allergy [4,6,7,8,9]. Serum lipid levels measured in Infosys lab, Victoria hospital. Otologic examination was done to rule out any ear pathology. Procedure was explained to the subjects.

Pure tone audiometry (PTA) is done by using ***Arphi 500 MK 1 audiometer*** [10]**.** American Society for Speech and Hearing Association [ASHA] 2005 Guidelines for manual pure-tone threshold audiometry (PTA) were followed [11]. Subject was made to wear earphones for air conduction assessment. First, sound at 1000 Hz was presented followed by 2000, 4000, 6000 and 8000 Hz and then again 1000 Hz, followed by 500 and 250 Hz. The intensity was increased in ascending order, 5 dB each time till the subject made a positive response by raising one hand. When the subject could hear the faintest sound, again the intensity was decreased by 10 dB, and another ascending series begun. After testing for air conduction, subjects were assessed for bone conduction by making them wear a bone vibrator. The initial frequency tested was 1000 Hz, followed by test 2000, 3000, and 4000 Hz. Then a retest of 1000 Hz was done before testing 500 and 250 Hz. Pure tone audiogram is plotted to determine the type of hearing loss. WHO (1980) recommended classification of hearing loss on basis of PTA taking average of thresholds of hearing frequencies with reference to ISO: R 389-1970 (International calibration of audiometers) [12] .

Statistical analysis: Mean, Standard deviation, percentages and ANOVA were implicated to analyse the data. P value <0.05 is considered significant.

RESULTS

Table 1: Age distribution of patients studied

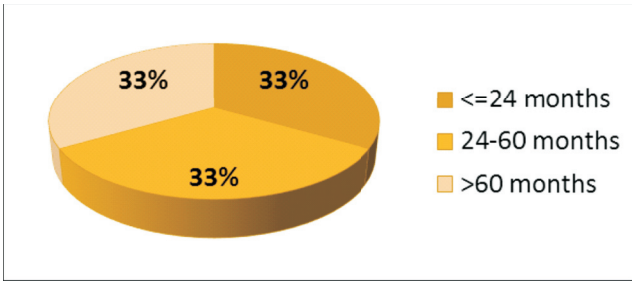
Age in years	Control		Cases	
	No	%	No	%
21-30	20	33.3	18	30.0
31-40	20	33.3	18	30.0
41-50	20	33.3	24	40.0
Total	60	100.0	60	100.0
Mean ± SD	35.77±7.35		35.53±7.68	

Samples are age matched with P=0.865

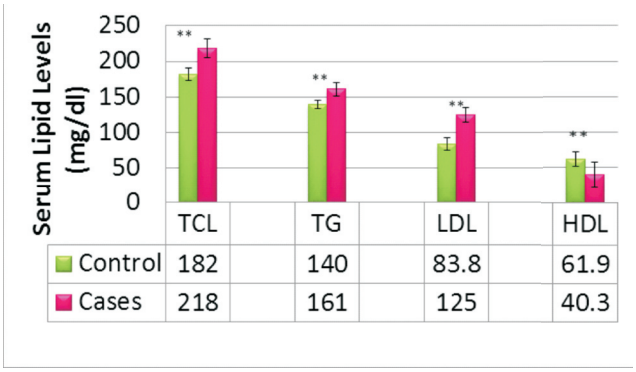
Table 2: Comparison of Height, Weight & BMI in two groups studied

	Control	Cases	P value
Height (cm)	162.73±9.68	169.70±10.86	<0.001**
Weight (kg)	60.43±8.46	64.90±9.49	0.008**
BMI (kg/m^2)	22.71±1.23	22.41±1.16	0.182

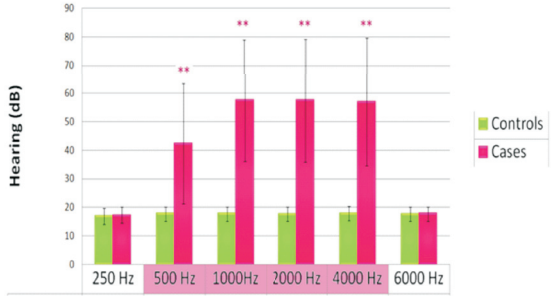
Graph 1: Cases with Duration of Dyslipidemia (months)



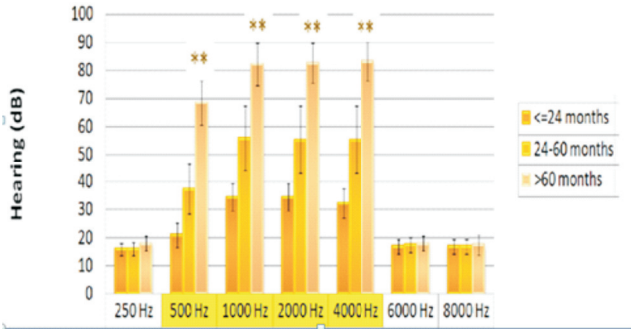
Graph 2: Comparison of Lipid Profiles among Cases and Controls (p<0.001)**



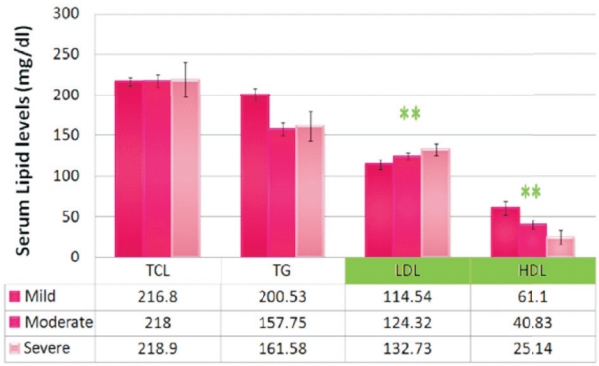
Graph 3 : Comparison of auditory thresholds in dB(AC 250- 6000 Hz, BC 250 – 4000 Hz)



Graph 4: Correlation of auditory threshold in dB (AC 250- 8000 Hz, BC 250- 4000 Hz)



Graph 5: Correlation of Lipid Parameters according to Degree of Hearing Loss



DISCUSSION

Subjects with elevated lipid levels had decreased air and bone conduction (AC=BC) than controls i.e sensorineural hearing loss [12] in the frequencies of 500 – 4000 Hz. Increasing duration of dyslipidemia , hearing loss also increased in severity. Significant rise in LDL, decrease in HDL found as sensorineural hearing loss increased from mild to severe degree (p<0.01). Total cholesterol and triglycerides showed no significant relationship among different degree of sensorineural hearing loss.

Cholesterol is a vital component of eukaryotic cellular membranes because it stabilizes them and modulates lipid and protein translocation across the membrane. Specifically related to the cochlea, the lipid composition, fluidity, and stiffness of the outer hair cell lateral wall membrane have been shown to be important to its electro motile function and the cochlear amplifier. The lateral wall plasma membrane of the outer hair cell also seems to have less cholesterol than other cells. These data suggest that outer hair cell function may be particularly sensitive to dyslipidemic states. Histologic changes in the guinea pig cochlea in response to dyslipidemia have been identified in the strial marginal layer and in

outer hair cells [3].

Cholesterol modulates electromotility mainly by influencing motor protein prestin. Prestin is essential for auditory processing. Prestin is specifically expressed in lateral membrane of outer hair cell of cochlea. Prestin is a transmembrane protein that mechanically contracts and elongates leading to electromotility of outer hair cell.

Hypercholesterolemia causes arteriosclerotic changes in vessel wall causing partial obstruction and end organ hypoxia. Oxidative LDL initiates atherosclerosis by forming fatty streakes generally prevented by HDL. Subjects of the study had increased LDL and decreased HDL leading to atherosclerosis. Cochlea supplied by end artery is highly sensitive to these changes.

Basal turn of cochlea is more active than apical turn. Increased cholesterol leads to glucose being converted to glycogen and more deposition of glycogen in apical turn. P-creatinine decreases more rapidly in basal turn than apical turn due to ischemia, making basal turn more vulnerable. Intracellular edema in stria vascularis present in the basal turn as a result of metabolic stress and deteriorating blood flow is the first sign of tissue damage. Edema of stria marginal layer and outer hair cell is the cause for auditory dysfunction.

Capillaries of the stria are normally very densely packed with RBC, so hematocrit of these vessels is far higher than capillary beds in other parts of body. Blood viscosity is higher, therefore blood cells move at lower viscosity. Free cholesterol is exchangeable between RBC membrane and serum lipoprotein. Increased serum cholesterol increases the cholesterol in membrane of RBC; thereby affecting the activities of membrane bound sodium potassium ATPase, affecting membrane permeability especially oxygen transfer. Cholesterol increases viscosity of red cell membrane and decrease their deformability making it difficult for them to travel microvasculature. Inner ear with higher metabolic activity is more sensitive to these changes [13,14].

CONCLUSION

Dyslipidemic subjects were found to have sensorineural hearing loss. Low density lipoprotein levels directly correlate whereas high density lipoproteins negatively correlate with severity of sensorineural hearing loss. Reduced auditory acuity does reflect about severity and duration of dyslipidemia.

Regular and periodic tests of audiometry are recommended for the dyslipidemic patients to find out a history of audiologic problems and ultimately prevent the subsequent complications. Early detection and intervention is most important factor in minimizing impact.

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Cognitive Function in Young Female with Subclinical Hypothyroidism

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ABSTRACT

Aims and Objective: Comparison of cognitive functions in young female patients with subclinical hypothyroidism and euthyroid subjects.

Material & Method: Sixty diagnosed cases, all female, with mean age of 40 ± 7years of subclinical hypothyroidism (SCH) were compared with 60 age and sex matched euthyroid controls. Neurocognitive tests such as Mini Mental State Examination (MMSE), Letter Cancellation test, Trail making Test A & B, Digit span forward and reverse test were performed in both the groups and were compared. Results were analyzed by calculating Mean±SD, using Student's t test.

Results: The characteristics of SCH patients and control cases were similar with regard to age, sex, and body mass index (BMI). Serum thyroid stimulating hormone levels (TSH) were significantly higher in SCH patients than the controls ($P < 0.001$). Statistically significant increase in the duration of Letter Cancellation test, Trail making Test 'A', and statistically significant decrease in Digit span forward and reverse test, in all SCH patients when compared to Euthyroid subjects. No statistically significant difference was found in the score of Mini Mental State Examination (MMSE), although the score was lower in SCH patient.

Conclusion: In addition to the decline in memory in SCH patient documented by earlier studies our work also points towards decline in visual scanning, response speed and sustained attention.

Key words: *Cognitive function, Subclinical Hypothyroidism.*

INTRODUCTION

Subclinical hypothyroidism is a biochemical diagnosis and used to describe patients with normal free thyroxine (T_4) and free triiodothyronin (T_3) and TSH levels of more than 5μIU/L, with generally no obvious symptoms of hypothyroidism. It reflects the earliest stage of thyroid dysfunction. Subclinical hypothyroidism (SCH) is common, ranging from 5% to 17% in the general population. In elderly population the prevalence of SCH is 20% in women and 9.5% in men.[1]

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Thyroid hormones have profound effects on the central nervous system and the overt hypothyroidism is well-established as a reversible cause of cognitive impairment. Low thyroid function irrespective of age has been found to have detrimental effect on cognitive functions because hypothyroidism prevents the brain from adequately sustaining the energy (glucose)-consuming processes needed for neurotransmission, memory and other higher brain functions. Low brain uptake of glucose is commonly associated with deterioration of cognitions.[2] Despite the clear biochemical pattern suggestive of mild hypothyroidism; few patients with SCH have typical hypothyroid symptoms. The only large study to systematically investigate symptoms in patients with overt and SCH as compared to euthyroid controls is the Colorado Thyroid Disease Prevalence Study.[3]

This large questionnaire- based study in 25,862 subjects reported a small but significant difference in symptoms between euthyroid and subclinical hypothyroid patients. The main problems reported were drier skin, poorer memory, slower thinking, weaker muscles, greater tiredness, more muscle cramps, more feeling cold, deeper and hoarser voice, puffier eyes and more constipation in SCH. The Tromso study compared symptoms in 154 controls and 89 SCH subjects with a TSH between 3.5 and 10.0 mU/l using a similar panel of questions. Tiredness, but none of the other symptoms, was significantly different between the groups.[4]

Most of the literature reviewed by us deals with elderly population. Few studies shows young adults with subclinical hypothyroidism may experience current cognitive impairment.

So in the present study, we examined whether there is an association between SCH and cognitive impairment in young adults and try to explore possible underlying mechanisms.

MATERIALS AND METHOD

Sixty female patients, 30 to 50 years of age were selected on the basis of non specific clinical features and biochemical profile (TSH> 5μIU/L, normal free T_3 and $T_{4)}$ suggesting subclinical hypothyroidism. They were recruited from the medical outpatient department, Maulana Azad Medical College & Associated LNH, New Delhi.

Control group comprised of sixty healthy subjects of the same age group of either sex, with same education, and socioeconomic status as patients with normal T_3, T_4 and TSH. They were selected from staff of hospital and accompanying relative of patients.

All the subjects in the study had minimal of twelve year of education.

INCLUSION CRITERIA

SCH was diagnosed by increased thyroid stimulating hormone (TSH) and normal thyroid hormone level. To avoid the effect of aging over cognition, we have included subjects below 50 years of age.

EXCLUSION CRITERIA

1. Subjects on thyroxine therapy or taking anti-thyroid medication or any other drug known to affect cognitive function.

2. Any major illness like diabetes mellitus, hypertension, CKD and Psychiatric disorder, Neurological disease or any other illness which is known to impair cognitive performance.

3. History of drug abuse including alcoholism.

The study protocol was approved by the institutional ethical committee, and informed written consent was obtained from all participants prior to the study.

Serum fT3, fT4 and TSH levels were assessed by Chemiluminescent Competitive Enzyme Immunoassay method with Access 2 immunoassay system of Beckman coulter. Normal range for TSH was 0.34 -5.00 μIU/ ml, 2.50 – 3.90 pg / ml for fT_3 and 0.61 – 1.12 ng/ dl for fT_4.

Subjects were then assessed on Neuro-Cognitive Test Battery.[5] In the Neurocognitive Battery; the tests were presented to all the subjects in the same order as has been mentioned here:

- Mini Mental State Examination (MMSE)
- Letter Cancellation test.
- Trail making Test 'A'
- Trail making Test 'B'
- Digits span forward and reverse test.

Mini Mental State Examination (MMSE)

The MMSE [6] allows a global assessment of cognitive state and consists of two parts, subdivided into sub-tests, evaluating verbal and performance ability. The four verbal sub-tests evaluate the orientation in time and in space, the memory (immediate and delayed recall), and the attention, giving a score up to 21 points. The two performance subtests relate to the capability to name the objects, to carry out written and oral orders, and to write and reproduce a complex geometric figure, giving a score up to 9 points. The maximum total score of MMSE is fixed at 30 points and a value below 24 is considered indicative of cognitive decline.

LETTER CANCELLATION TEST

This test assesses visual scanning, response speed and sustained attention. The subject is presented

with letters of English alphabet, and is instructed to cancel out specific letters. The score is the time taken by subject to actually perform this task. In addition, the numbers of different errors (omissions and commissions) done by the subject are also counted.

TRAIL MAKING TEST

Part A: Assesses visuomotor speed and attention. The subject is instructed to draw a straight line to connect 25 consecutive circles. The score is the time taken by the subject to complete the task.

Part B: In addition to visuomotor speed and attention, it requires the patient to shift attention and hence, is a sensitive measure of executive function as well. The test was administered immediately after the Trail Making Test A and the subject is instructed to connect 25 numbered and lettered circles by alternating between the two sequences. The score is the total time taken by the patient to complete the task. A maximum of 300 s is allowed. Performance is rated by the time required to finish the test; higher scores indicate poorer performance

DIGIT SPAN

Digits Forward: assesses immediate verbal memory span. In the test, subjects must repeat back sequences of digits of increasing length read out by the examiner. The score is maximum number of digits that the patient can recall

Digits Backward: In addition to auditory attention and short-term retentive capacity this test also assesses the ability to manipulate information in the verbal working memory (and hence is sensitive measure of executive function). The subject has to repeat the sequences of numbers of increasing digit length in reverse order to what was said by the examiner. The score is the maximum number of such digits that the patient is able to reverse.

STATISTICAL ANALYSIS

All data are expressed as mean ± standard deviation (SD). The analysis was performed using Graphpad instat prism 6. Statistical significance was accepted at $P<0.05$. Comparison among control and cases were performed by two tailed student's t test.

RESULTS

Table I demonstrates that patients in both Group 1 and Group 2 had no statistically significant differences in the age and sex distribution. Revised Kuppuswami's scale was used for determining socio-economic status of the two groups. Both the groups had the patients from middle socioeconomic group and no significant difference was observed in number of year of education. **Table II** shows Thyroid function Test of SCH and Euthyroid control. The TSH of the SCH patients was 7.16. ± 1.23, statistically significant when compared with that of controls whose value was 3.12 ± 1.06 ($p= 0.000$). The TPO antibodies were within normal limit for both groups. Difference in the Serum fT_3, fT_4 of SCH and Euthyroid control was statistically insignificant. **Table III** shows outcome of Neurocognitive test in SCH and Euthyroid control Comparing the score of MMSE of subjects with subclinical hypothyroidism with that of euthyroid subjects, the differences in the score was not statistically significant but lower in the former group. Mean scores tended to be higher in Letter cancellation test, which assesses visual scanning, response speed and sustained attention in patient with SCH when compared to that of Euthyroid control(149.41± 9.64 vs. 121.23 ± 3.22 $p<0.000$).It was observed that the cases diagnosed with SCH, as compared to the control group, obtained higher scores in Trail making test 'A' (127.6±12.28 vs. 97.4± 22.8.$p<0.000$), and Trail Making Test 'B' (211.6 ± 53.44 vs. 150.44 ± 80.55. $p<0.000$). Forward digit span test score was significantly lower in patients with subclinical hypothyroidism compared with euthyroid subjects (697± 1.92 vs7.85 ± 1.58. $p<0.006$). Reveres digit span test score was significantly lower in patients with subclinical hypothyroidism compared with euthyroid subjects (4.5±1.50 vs. 5.18± 1.51. $p<0.029$).

DISCUSSION

Subclinical hypothyroidism is defined as an elevated TSH levels despite of normal circulating level of T4 and T3 concentrations plus the absence of features of clinical hypothyroidism. Most of the subclinically hypothyroid patients present with mild, nonspecific symptoms possibly signalling to a mild hypothyroidism or a subclinical hypothyroidism.[7]

The impact of overt thyroid failure in cognitive function is well studied but very limited research has been done to establish the association between subclinical hypothyroidism and cognitive function in young adults.Therefore we aimed to evaluate the cognitive function of patients with SCH in

comparison with healthy euthyroid controls.

In the present study, two groups were well matched for age, sex and socio-economic status. Mean TSH in subclinical hypothyroidism group was 7.16 mIU/liter and compared well with most other studies.[4, 8]

In our study Mini-Mental State Examination, which looks for Global cognitive decline shows no statistically significant association with subclinical hypothyroidism. This observation of ours is in alignment with Luboshitzky *et al*.[9] who also reported no significant differences in cognitive impairment measured by the Mini-Mental State Examination in 39 untreated sub-clinically hypothyroid patients compared to 570 euthyroid controls.

Letter cancellation test was employed for assessing visual scanning, response speed and sustained attention. Trail Making Test was utilized for assessment of visuomotor speed, attention and executive function. Subjects were also tasked on Digit Span Test for immediate verbal memory, auditory attention, short term retentive capacity, reaction time and executive function. SCH group performance was poor on the above mentioned tests compared to Euthyroid subject and the difference was statistically significant, suggestive of cognitive decline in SCH patient.

Monzani et al.[10] found memory deficits in a group of 13 women and 1 man (29 to 47 years old) with untreated subclinical hypothyroidism compared to 50 euthyroid control subjects. Similarly, Baldini et al.[11] found that 19 young and middle-aged women with subclinical hypothyroidism showed worse memory, but no differences in scores of mental control, attention, or visuospatial abilities compared with 17 euthyroid control women. del Ser Quijano et al.[12] identified slower reaction time, reduced verbal fluency, and impaired visual memory in a group of 15 young adults with subclinical hypothyroidism compared with a group of 15 euthyroid control subjects. Cook et al.[13] reported that elderly patients with subclinical hypothyroidism performed more poorly than euthyroid individuals on measures of verbal recall as well as on the Mini-Mental State Examination but working memory and processing speed were unaffected.

Executive functions are performed by Pre-frontal networks which include dorsolateral prefrontal, medial prefrontal and orbitofrontal components and the sub- structures with which they are interconnected (i.e. head of caudate and dorsomedial nucleus of thalamus)[14]. Dorsolateral prefrontal cortex (dlpfc) and anterior cingulate cortex plays a uniquely critical role in orchestrating working memory, attention and attentional set-shifting strategies [15, 16]. Evidence, using SPECT, suggest that cerebral hypoperfusion may have effects on areas controlling attention, motor speed, memory and visual-spatial processes in overt hypothyroidism [17]. The decrease in global cerebral perfusion in hypothyroidism was associated with increased vascular resistance [18].

Our study shows decline in visual scanning, response speed and sustained attention and executive function which in studies done by Monzani et al. , Baldini et al. & del Ser Quijano et al. found to be unaffected.[10, 11, 12]

CONCLUSION

In addition to the decline in memory in SCH patient documented by earlier studies our work also points towards decline in visual scanning, response speed and sustained attention. Since cognitive impairment is seen in both elderly and young adult SCH patient further comparative studies are needed to quantify the degree of impairment.

Table-1: Demographic and Metabolic characteristics of patients and controls

Parameters	Subclinical hypothyroid (n = 60)	Euthyroid controls (n= 60)	p value
Age (years) (range)	40. 43 ± 7.82 (30 – 50)	41.13 ± 6.06 (32 – 50)	0.700
Weight (kg)	63.13 ± 6. 32	63. 43 ± 8. 28	0.875
BMI (kg/ m^2)	25. 06 ± 2.70	24.62 ± 2. 73	0. 542
Socio-Economic Status	Middle	Middle	
Education (Years)	>12 Years	>12 Years	

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

BMI = Basal metabolic index

Table 2: Thyroid function values of patient and control

Parameters	Subclinical hypothyroid (n=60)	Euthyroid controls (n=60)	P value
f T_3 (ng/dl)	0.279±.078	0.303±.069	0.216
fT_4 (ng/dl)	1.53±0.44	1.50±0.39	0.738
TSH (μIU/L)	7.16± 1.23	3.12±1.06	0.000

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

TSH: Thyroid stimulating hormone, fT_4: free thyroxine, f T_3: free tri iodo thyroxine

Table 3: Comparison of Neurocognitive test in SCH and Euthyroid control

Parameters	Subclinical hypothyroid(n=60)	Euthyroid controls(n=60)	P value
MMSE (score)	25.91± 0.53	26.24± 0.61	0.278
Letter cancellation test (sec)	149.41± 9.64	121.23 ± 3.22	0.000
Trail making test 'A' (sec)	127.6 ± 12.28	97.4 ± 22.8	0.000
Trail making test 'B' (sec)	211.6 ± 53.44	150.44 ± 80.55	0.000
Forward digit span test	6.97± 1.92	7.85 ± 1.58	0.006
Reverse digit span test	4.5±1.50	5.18± 1.51	0.029

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

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

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Electrocardiographic Changes in Relation to Pregnancy

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ABSTRACT

Background: There are various physiological factors that affect ECG waveforms which include sex,age, ethnicity, height, weight, torso morphology, body mass index, and pregnancy. Such characteristics account for the differences among individuals and produce interindividual variability in ECGs. Physiological and anatomical alterations develop in many organ systems during the course of pregnancy and delivery. The pregnancy-induced changes in the cardiovascular system develop primarily to meet the increased metabolic demands of the mother and fetus. The present study was done to find out the electrocardiographic changes in relation to pregnancy.

Objectives: 1) To study variations in ECG waveforms in 3rd trimester of normal pregnancy.

2) To find out significance of these variations.

Methodology: This case-control study consisting of 30 normal non pregnant women and 30 normal healthy pregnant women, each between ages 18-30 years were selected from student population and from obstetric outpatient department, VIMS, Bellary respectively.The ECG was recorded and was evaluated for different parameters like heart rate, P wave, PR interval, QRS complex, QRS axis, QT interval and QT_c interval and results were drawn.

Results: There was statistically significant increase in heart rate, QT interval, QT_c interval in 3rd trimester pregnant women when compared to controls and also statistically significant decrease in PR interval and QRS axis in 3rd trimester pregnant women when compared to controls.

Conclusion: The study shows that there are a variety of adaptations of cardiovascular system during normal pregnancy which bring about changes in ECG in the absence of any cardiac disease. Knowledge of these changes is essential in the management of women with cardiovascular disease.

***Keywords**: ECG, Pregnancy, cardiovascular system.*

INTRODUCTION

An important factor to consider when reading electrocardiograms for clinical decision making is that the wave forms are influenced by normal physiological and technical factors as well as by pathophysiological factors. Physiological factors that affect ECG wave forms include sex, age, ethnicity, height, weight, torso morphology, body mass index, and pregnancy. Such characteristics account for the differences among individuals and produce interindividual variability in ECGs.[1]

Pregnancy although a physiological phenomenon, affects all the functions of maternal body.The cardiovascular changes which occur normally during pregnancy sometimes simulates heart disease.[2] In normal pregnancy, functional systolic heart murmurs are quite common.[3] It is of great importance to detect the presence or absence

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of systolic murmur and to identify it as innocent or significant to heart disease.[4] Heart disease in pregnancy remains a serious problem and all possible helps in its diagnosis and management are needed including electrocardiogram. However, for accurate use of this the changes of the electrocardiogram in normal pregnancy must be known.[5]

To have diagnostic specificity the ECG changes must exceed normal variations encountered during pregnancy.[6]It is important not to diagnose heart disease when none exists and at the same time not to fail to detect and appropriately treat heart disease when it does exist.[3]

The objective of the present study is to determine electrocardiographic changes in normal pregnancy.This study is undertaken to highlight the effects of pregnancy on the electrocardiogram and thereby help to differentiate from that of pathological changes.

MATERIALS AND METHOD

The case-control study was conducted in the Physiology department, VIMS, Bellary. Thirty normal non pregnant women and 30 normal healthy pregnant women, each between ages 18-30 years were selected from student population and from general population and from obstetric outpatient department, VIMS, Bellary respectively. This study was approved by the Institutional ethics committee.

Following an explanation about the nature and purpose of the study, those subjects who were willing to participate in the study were included after obtaining informed consent.

A detailed history was taken from the subjects which was followed by a detailed physical examination. A pre-tested structured proforma was used to record relevant information from each individual.

Physical examination included measuring height in centimeters, weight in kilograms, recording resting pulse rate by palpating radial artery and blood pressure recording with a mercury sphygmomanometer. Clinical examination of cardiovascular and respiratory systems was done in detail.

Following detailed assessment of the subjects, they were screened for the presence of inclusion and exclusion criteria and dropped if any exclusion criteria were present.

Individuals with heart diseases like valvular heart disease, myocardial infarction, congenital heart disease, arrhythmias, and hypertension, respiratory diseases like chronic obstructive pulmonary disease, corpulmonale, individuals with anaemia, thyroid disorders and individuals on medication were excluded.The instrument used to record electrocardiogram wasthe Magic R 12 channel electrocardiograph designed by Mediline's team of biomedical engineers.Following detailed assessment of the subject, a 12 lead electrocardiogram was recorded during the resting state.The ECG was recorded and was evaluated for different parameters like heart rate, P wave, PR interval, QRS complex, QRS axis, QT interval and QT_c interval and results were drawn.

Statistical Analysis: The data was compiled on Microsoft excel and analyzed using SPSS(Statistical Package for Social Sciences) version15 (SPSS Inc., Chicago, IL, USA).Data was presented as mean±SD for continuous variables. Independent Student's 't' test was usedto compare quantitative variables between pregnant and non-pregnant groups.Differences were considered as significant if *p*-value<0.05.

RESULTS

Age wise distribution of study population was summarized in figure-1.

Heart rate: The mean heart rates (beats/ min) were 75.13±14.9 and 89.60±6.1 among the controls and pregnant women respectively (Table-1). There was an increase in heart rate among pregnant when compared to controls and this increase was statistically significant (p<0.01). Systolic blood pressure, Diastolic blood pressure, Pulse rate and respiratory rates of study population were also summarized in table-1.

P wave: The P wave durations (in seconds) were 0.08±0.005 and 0.07±0.008 among controlsand pregnant women respectively (Table-2). There was no statistically significant difference between the two groups (p = 0.26). The P wave amplitudes were (in mm) 1.00±0.13 and 1.08±0.23 among controls and pregnant women respectively (Table-2). There was no statistically significant difference between the two

groups (p = 0.09).

PR interval: The PR intervals (in seconds) were 0.15±0.01 and 0.13±0.01 among controls and pregnant women respectively (Table-3). There was statistically significant decrease in PR interval among pregnant women when compared to controls (p < 0.01).

QRS complex: The QRS complex durations (in seconds) were 0.07±0.00 and 0.07±0.01 among controls and pregnant women respectively (Table-3). There was no statistically significant difference between the two groups (p = 0.58).

QRS axis: The QRS axis (in degrees) were 64.63±7.32 and 45.63±16.0 among controls and pregnant women respectively (Table-3). There was statistically significant decrease in QRS axis among pregnant women when compared to controls (p <0.01).

QT interval: The QT intervals (in seconds) were 0.32±0.01 and 0.35±0.01 among controls and pregnant women respectively (Table-3).There was statistically significant increase in QT interval among pregnant women when compared to controls (p < 0.01).

QT_C interval: The QT_C intervals (in seconds) were 0.38±0.01 and 0.40±0.01 among controls and pregnant women respectively (Table-3). There was statistically significant increase in QT_C interval among pregnant women when compared to controls (p < 0.01).

DISCUSSION

Many physiological factors affect the electrocardiographic wave forms. In this study "Electrocardiographic changes in relation to pregnancy" the effects of third trimester pregnancy on electrocardiogram were analyzed.

In this study, there was statistically significant increase in heart rate in 3rd trimester pregnant women when compared to controls.This increase in heart rate is linked to autonomic nervous system changes that produce alterations in cardiac autonomic modulation.In early pregnancy, the change in heart rate may be linked to endocrinal factors like production of chorionic gonadotropin while later gradual increase is related to vascular changes which accompany placental and fetal growth.[7]

This increase in heart rate during third trimester compensates for the fall in stroke volume resulting from caval compression.[8] Also the cardiac output increases as early as 5 weeks and rises to 45% above the baseline at 24 weeks of gestation. This is achieved by increase in heart rate and stroke volume.[9]

Similar findings were reported by Uleand K et al[10], Katz R et al[11], Lechmanova M et al[12], Desai DK et al[13] and Stein PK et al[14].

P wave duration and amplitude measurements did not show any statistically significant difference in pregnant women in 3rd trimester when compared to controls.

In this study, PR interval showed statistically significant decrease in 3rd trimester pregnant women compared to controls.The decrease in PR interval during pregnancy could be due to shortening of AV conductance with respect to increase in heart rate that accompany during pregnancy.[15]Similar findings were reported by Carrutn JE et al[6] and Lechmanova M et al[12].

QRS complex measurement showed no statistically significant differenceamong 3rd trimester pregnant women when compared to controls.

In this study, QRS axis showed statistically significant decrease in 3rd trimester pregnant women compared to controls.The change in electrical axis can be attributable to:

1. The diaphragm raising as pregnancy advances.[16]

2. Changes in the left ventricular size and mass with associated increased volume may cause the apical impulse to be displaced to the left. Elevation and rotation of the heart, resulting from the enlarging uterus, also contribute to the displacement.[9]

3. In early pregnancy the left axis shift can be explained from the fact that there is increased blood volume which causes left ventricular load.[2]

Similar findings were also reported from Misra J et al[2], Carruth JE et al[6], Lechmanova M et al[12] , Singh AD et al[16], in their studies.

In this study, we found a statistically significant increase in QT interval in 3rd trimester pregnant women compared to controls.These changes were attributed to changed spatial arrangement of chest organs during pregnancy, changed electrical

properties of the myocardium due to changed sympathetic and hormonal modulation (epinephrine, progesterone) of the electrical heart activity during pregnancy.[17]Similar findings were reported by Lechmanova M et al[12] and Kittnar O et al[17] in their studies.

In this study there was statistically significant increase in QT_c interval in 3rd trimester pregnant women compared to controls. The increase in QT_c interval may be due to increase in heart rate. This could be linked to changes in ventricular depolarization and repolarization patterns during pregnancy and they must be considered as a complex consequence of changes in regulatory mechanisms during normal pregnancy.[12] It is concluded that prolonged QT_c interval should be interpreted simply as "an unspecific sign of changed course of repolari zation".[17]Similar findings were reported by Carruth JE et al[6],Lechmanova et al[17],OramS et al[18] in their studies.

TABLES

TABLE-1: Comparison of Pulse (bpm), Blood pressure (mmHg), Heart rate (bpm) and Respiratory rate between pregnant and non pregnant women

Variables	Pregnant (Mean ± SD)	Non-pregnant (Mean±SD)	p-value
Pulse rate (bpm)	89.53 ± 6.1	77.77 ± 5.18	0.00*
SBP (mmHg)	120.93 ± 3.6	121.87±13.5	0.71
DBP (mmHg)	71.47 ± 18.2	78.87 ± 3.3	0.03*
Heart rate	89.60 ± 6.1	75.13 ±14.9	0.00*
Respiratory rate	16.27 ± 0.9	16.10 ± 0.5	0.42

SBP: Systolic blood pressure; DBP: Diastolic blood pressure.

* indicates a significant p-value (p<0.01).

TABLE-2: Comparison of 'P' wave between pregnant and non pregnant women

Variables	Pregnant (Mean±SD)	Non-pregnant (Mean±SD)	p-value
Duration (sec)	0.07±0.008	0.08±0.005	0.26
Amplitude (sec)	1.08±0.23	1.00±0.13	0.09

TABLE-3: Comparison of PR interval, QRS complex, QT interval, QTc interval and QRS frontal axis between pregnant and non-pregnant women

Variables	Pregnant (Mean±SD)	Non-pregnant (Mean±SD)	p-value
PR interval	0.13±0.01	0.15 ± 0.01	0.00*
QRS complex	0.07 ± 0.01	0.07±0.00	0.58
QT interval	0.32± 0.01	0.35 ± 0.01	0.00*
QTc interval	0.40 ± 0.01	0.38 ±0.01	0.00*
QRS axis	45.63 ± 16.0	64.63 ± 7.32	0.00*

* indicates a significant *p-value* (*p<0.01*).

FIGURES

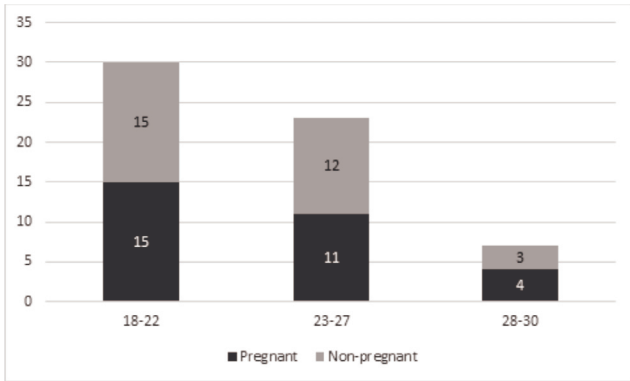

FIGURE-1: Age-wise distribution of pregnant and Non-pregnant women

CONCLUSIONS

The following conclusions can be drawn from the results of this study.

There was a statistically significant increase in heart rate, QT interval and QTc intervals; a statistically significant decrease in PR interval and QRS axis in 3rd trimester pregnant women compared to controls. Though our study is by no means exhaustive, it does provide a glimpse into the variety of adaptations of cardiovascular system during normal pregnancywhich bring about changes in ECG in the absence of any cardiac disease. The pregnancy-induced changes in the cardiovascular system develop primarily to meet the increased metabolic demands of the mother and fetus.

Knowledge of these changes is essential in the management of women with cardiovascular disease.[19]Although we understand to some extent these changes and also since few studies have been

done on this aspect, further research is needed to study the effect of pregnancy on electrocardiogram.

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Morphological Study of Trachea in the Different Age Groups of Indian Adult Males

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ABSTRACT

Maharashtra is one of developing state in the India with the more elderly population. This rapidly increasing population is a new & important group in terms of social & health policy in the country, as retired geriatric population is increasing day by day & there is a striking increase in their life expectancy & age is a key risk factor for coronary artery disease. There is more risk of morbidity & mortality from coronary artery diseases with increasing age. So evaluation of the cardiac functions of retired persons is essential. Objective - To analyze the cardiovascular function of retired geriatric population in term of measurement of ejection fraction by echocardiography. In this study 100 Retired persons aged 58 year & above without known hypertension, diabetes, renal diseases as study group & 100 healthy adult aged 18-57 year as control group were included in this study. All were obtained from different area of Maharashtra. Result - Significant decrease of ejection fraction was found in the study group (58 year & above) in conparrison to control group ($p<0.01$). The mean ejection fraction in different age group shows that there is decrease in ejection fraction of study groups that the control irrespective of age. Conclusion- Though the mean ejection fraction value was significantly decreased in 58 years & above, which was progressively decreased by age, yet nearly all the values (2.72%) were within normal physiological limits. So it seems that the retired geriatric population was having good cardiac function in Maharashtra in our setting.

Keywords: *Retirement, Geriatric fraction, Echocardiography.*

INTRODUCTION

Geriatric population is defined as population aged 60 years & above. The phenomenon of population aging (defined as increase in the median age of the population) is already a major social & health problem in the developed courtiers. As a population of the total population the geriatric population has been elderly is a challenge to medical profession, the administration & society.

A small population (around 10%) of the total population of India constitutes the elderly population but the absolute number of them is quite significant. The rate of their increase is fairly high.[1, 2]

The physiological show a marked increase in inter-individual variation in function. Many physiological processes in older people deteriorate substantially but some individual show little or no change.

Environmental factors such as lack of exercise, poor diet, cigarette smoking & alcohol consumption are thought to play a vital part in this & a healthy & alcohol consumption are thought to play a vital part in this & a healthy life style remains worth encouraging. Genetic factors may also be important in explaining individual variation.[3]

The outstanding physiological changes in the cardiovascular system due to aging are progressive slowing of the resting heart rate & reduction of maximum heart rate following exercise. However the resting heart rate rises again at old age. Loss of elasticity of the vessels also occurs. The blood pressure particularly the systolic blood pressure progressively rises .[4, 5]

Retirement means to withdraw from something, according to the dictionary. Until the final, irrevocable, & moral retirement arrives, whenever one withdraws from something, one cannot escape from going in into something else. For an active healthy person, retirement Cain means only withdrawing from one from of activity to enter into another.[6] on retirement, the income is suddenly reduced. Economic relationship with continued low standard of living, affects the body & mind. Retirement, change in housing, illness or death of spouse greatly affect the physical wellbeing of the aged persons. The socioeconomic problems of the elderly are aggravated by the lack of social security, inadequate facilities for health care, rehabilitation & recreation.

The notion that retirement harms health is a durable one, which has persisted for several related reason-loss of income, isolation frustration & disesteem can attend retirement. Against this rationale for heath decline, the opposite notion that retiring can benefit health. It is reasonable to argue that removal from a noxious work environment or reduction of work role demands could have a protective effect on health.[7]

MAJOR LIFE EVENTS IN OLD AGE

1. An adjustment reaction to age characterized by mild anxiety, uncertainty about future plans, mild slip disturbance may depression.

2. A more severe depression requiring fairly intensive psychopharmacological & psychotherapeutic treatment.[8]

The ejection fraction is a valuable index of ventricular function.9 Damage to the muscle of the heart, during myocardial infarction or in cardiomyopathy, impairs the heart's ability to eject blood & therefore reduces ejection fraction. This reduction in the ejection fraction can manifest it self clinically as heart failure. In addition, ejection traction is one of the most important predictors of prognosis.

Ejection fraction is commonly measured by echocardiography. Other methods of measuring ejection fraction include cardiac MRI, fast scan cardiac computed axial tomography (CT) imaging, and ventriculography.

Right ventricular volumes being roughly equal to those of the left ventricles, the ejection fraction of the right ventricles is normally to that of left ventricles.[9]

Left ventricular ejection fraction (LVEF) is determined by the echocardiography provides important diagnostic, & prognostic information patients with known or suspected heart diseases.

Table – 1: Explains the qualitative echocardiographic L V E F categories.

Category	Values
Hyper dynamic	75%
Normal	65%
Lower limit of normal	50%
Mildly reduced	45%
Mild to moderately reduced	30%
Moderately reduced	35%
Moderate to severely reduced	30%
Severely reduced	25%

Value below 45% usually represents some decrease in the pumping strength of the heart, while values below 30 to 35% are representative of an important decrease. [10]

Geriatric population is on increase in our country & their morbidity & mortality is associated with cardiac consequences. Therefore, the present study has been desing to find out the health status of the retired geriatric population in terms of cardiac status by pulse rate, blood pressure measurement & measuring ejection fraction. The output of this study obviously may help in awareness building with remedy at least in part for geriatric health protection.

METHOD

This cross sectional study was carried out in the Department of physiology, government Medical College, Miraj. A total number of 100 retired subjects age 58 & above were included in this study. All the subjects were apparently healthy both physically & mentally individual completed questionnaire concerning marital & socioeconomic status, history of smoking had it, hypertension & diabetes mellitus, history related to are, history of mental state, history of social state. The entire subjects were in middle socio-economic condition. The questionnaire of every subject was filled up by interviewing as well as physical examination of the subjects.

The subjects were obtained from different ares of greater Mymensingh districts before taking blood

sample, the subjects were briefed about the objectives of the study & their informed consents were taken. A total number of 100 healthy adult age 18 years to 57 years were taken as control group.

A standard echocardiogram is also known as a Trans-thoracic echocardiogram (TTE) or cardiac ultrasound. In this case, the echocardiography transducer or prove is placed on the chest wall or thorax of the subject & images are taken through the chest wall. The images are displayed on a monitor & are recorded either by videotape (analog) of by digital technique. For Trans-thoracic examination, position canned from several different left intercostals. The standard trans-thoracic views are recorded form parasternal & apical transducer position. Ejection fraction was calculated by Teichholz method. Data were expressed as mean ± SD & analyzed statistically by unpaired' test.

RESULTS

Demographic characters of the study population are presented the mean ejection fraction in different groups. The highest value of ejection fraction of study group was 91% & lowest value was 48%.

The mean ejection fraction was significantly (p<o.o1) lower in study group than that of control group. Again in male, ejection fraction in study subjects (63.84 ± 78.81) was significantly (p<o.o5) lower in comparison to that of control subjects (678.65±8.783).

In female the study subjects had significantly (p<o.o5) lower mean ejection fraction (61.46-+5.66) than that of control subjects (65.32±6.51).

The mean ejection fraction in different age group stated that there is decreased of ejection fraction in study group a than the control group irrespective of age.

DISCUSSION

In the present study there was significant decrease in mean ejection fraction of study group when compared of study males were significantly lower than inconsistent because age did not appear to influence ejection fraction at rest.

It was observed that only 6 cases out of 100 cases of study groups have ejection fraction between 40% to 55% and they have mild left ventricular systolic dysfunction and the remaining have normal left ventricular function.

In 2001 the strong heart study documented the prevalence of left ventricular dysfunction in 3184 American Indians. They categorized ejection fraction of 40-50 as mild left ventricular dysfunction and ejection fraction < 40 as severe left ventricular dysfunction. In that study, 86% of patients had normal left ventricular function, 11.1 % had mild left ventricular dysfunction and 2.9% had severe left ventricular dysfunction.[11]

Another evaluation by Shively &associates found that echocardiographic measurement such as diastolic volume 4 ejection fraction of older group were not significant from those in the young groups.

CONCLUSION

In this study there was significant decrease in ejection fraction of study group when compared to control group & also between study male & female with control male & female. But nearly all (except2.72% of study population) the results of individual of both groups were in physiological norms.

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Conflict of Interest - to evaluate the status of cardio-vascular system in retired persons

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Effect of Serum Albumin on Cognitive Function in Elderly Person

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ABSTRACT

Aim: To examine the effect of serum albumin level on Cognitive function among healthy elderly population.

Introduction: Cognitive impairment (CI) is associated with decreased memory function and/or other neuropsychological deficits, The important pathogenesis involved in cognitive impairment and dementia is oxidative injuries. Serum albumin constitutes the plasma's primary oxygen radical trapping and antioxidant defense, both against oxidizing agents generated endogenously and exogenous substances. Serum albumin plays a vital role in the binding of drugs; hormones, iron and free fatty acids, and reduced levels may contribute to cognitive impairment resulting from toxicity.

Material and method: The subjects selected for the study were community dwelling elderly male in the age group of 60 -80 years, self supported in their activity of daily living and well matched for age, BMI, education level(Education in years) and socio-economic status. The study group was divided into two based upon their serum albumin level**,** Group **1(**Normal serum albumin level) and Group II **(**Decreased serum albumin level). Albumin Assay was carried out by the DAX system which uses anionic dye, bromocresol green (BCG) which preferentially binds serum albumin at pH 4.2, this albumin-dye complex is determined spectrophotometrically.

Neuropsychological Assessment were carried out with Rey's Auditory Verbal Learning Test (RAVLT) Rey's complex figure test (CFT) and Wechsler Memory Scale (WMS) -digit and spatial span respectively.

Result : Group I had significantly better scores on following variables; RAVLT: Total, Average, immediate recall and delayed recall scores; CFT: 3minutes and 30 minutes; WMS-spatial span-forward and backward compared to Group II.

Conclusion: The present study suggests that a lower serum albumin concentration in healthy elderly male was associated with cognitive impairment.

Keyword: *Cognition, Serum Albumin*

INTRODUCTION

Cognitive impairment (CI) is associated with decreased memory function and/or other neuropsychological deficits, such as impairment of executive functions, apraxia, agnosia or aphasia. This represents a major risk factor associated with loss of personal independence and, finally, with the development of dementia, especially Alzheimer's disease, which is the most common form of neurodegenerative dementia in the elderly[1].

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The important pathogenesis involved in cognitive impairment and dementia is oxidative injuries. Free radicals induce cell death by damaging lipids, DNA, proteins, and carbohydrates while reactions between free radicals and neurotransmitters can lead to the formation of endogenous neurotoxins[2].

Serum albumin constitutes the plasma's primary oxygen radical trapping and antioxidant defense, both against oxidizing agents generated endogenously and exogenous substances[3].

Serum albumin plays a vital role in the binding of drugs; hormones, iron and free fatty acids, and reduced levels may contribute to cognitive impairment resulting from toxicity[4]. Albumin also inhibits the formation of myeloid beta-peptide fibrils, and low levels of albumin in the brain and cerebrospinal fluid may therefore lead to increased Alzheimer's type pathology[5, 6].

Low levels of serum albumin were found to be associated with an increased risk of cognitive impairment in 1,511 hospitalized patients with heart failure, and 331 elderly rehabilitation patients with hip fractures[7, 8]. Lower levels of serum albumin have also been observed in Alzheimer's disease (AD) patients in comparison with healthy volunteer controls [9, 10]. An association between low serum albumin and cognitive function decline was also observed in 1,284 older adults from the Longitudinal Study Amsterdam, though this was limited to a borderline association with MMSE scores [11,12].

Therefore, the main aim of the present study was to examine the effect of serum albumin level on Cognitive function among healthy elderly population since the identification of hypoalbuminemia, in the elderly may be useful in the early detection and treatment of cognitive impairment if any.

MATERIAL AND METHOD

The subjects selected for the study were community dwelling elderly male in the age group of 60 -80 years, self supported in their activity of daily living and well matched for age, BMI, education level(Education in years) and socio-economic status. The study group was divided into two based upon their serum albumin level. Normal value of serum albumin was taken as 3.5-5.5gm/dl [13].

Group 1(n=50)-Normal serum albumin level

Group 2(n=50)-Low serum albumin level

ALBUMIN ASSAY

Analyses were carried out using the DAX system (Bayer Diagnostic, Dublin, Ireland). An anionic dye, bromcresol green (BCG) preferentially binds serum albumin at pH 4.2, this albumin-dye complex is determined spectrophotometrically. The increase of absorbance measured at 604nm after 30 seconds is directly proportional to the concentration of complexed albumin. Assay parameters are pre-programmed into each DAX system[14].

EXCLUSION CRITERIA

Subjects with dementia or other neurodegenerative disorder, stroke, major depressive disorder, psychosis, anxiety disorder, severe hearing and visual impairment were excluded from the study.

SCREENING METHODS

Subjects were screened with Geriatric Depression Scale-15 (GDS-15) [15] Hindi Mental State Examination (HMSE) [16] an Indian adaptation of Mini Mental State Examination and Mini-International Neuropsychiatric Interview [17] for excluding dementia, depression and other psychiatric disorders Subjects with a GDS score of more than 4 and HMSE score less than 26 out of maximum 31 were excluded from the current study.

NEUROPSYCHOLOGICAL BATTERY

The tests were administered usually in a single sitting of 60-90 min duration. Subjects were given a break for few minutes if required. Assessment of verbal, visual and working memory were carried out with Rey's Auditory Verbal Learning Test (RAVLT), [18] Rey's complex figure test (CFT) [19] and Wechsler Memory Scale (WMS)-digit and spatial span [20] respectively. These are standard neuropsychological tests used widely in many studies. We had used the Indian adaptation of these tests. [21]

THE REY AUDITORY VERBAL

Learning Test (RAVLT) [18] assessed verbal memory and learning. Participants were read a list of 15 common words five times. Immediately after each time, they were required to recall as many words as possible. After the fifth trial, an interference list was presented, after which participants had to spontaneously recall the original words. Finally,

participants were required to spontaneously recall the original words after a 20 minute delay. Scores were calculated as the total number of words recalled (1) across the five trials (total acquisition); (2) after the interference list (recall after interference); (3) on the fifth trial minus after the interference (loss after interference); and (4) after the delay (long delay free recall).

Rey's complex figure test (CFT)

Rey's CFT included reproduction of a complex line drawing, initially by copying and later from memory after a gap of 3 min and 30 min.

WMS-digit and spatial span

WMS digit span test included verbal repetition of the series of digits in forward and backward order. WMS spatial span test is a visual analogue of digit span test, which included tapping of prearranged blocks in forward and backward sequence.

Statistical analysis

All data are expressed as mean ± standard deviation (SD). The analysis was performed using Graphpad instat prism 6. Statistical significance was accepted at P<0.05. Comparison among control and cases were performed by two tailed student's t test.

Table-1: Demographic and Metabolic characteristics of patients and controls

Parameters	Group 1 (n = 50)	Group 2 (n=50)	p value
Age (years) (range)	70. 43 ± 8.82 (60 – 80)	71.13 ± 6.06 (60 – 80)	0.700
Weight (kg)	63.13 ± 6. 32	63. 43 ± 8. 28	0.875
BMI (kg/m^2)	25. 06 ± 2.70	24.62 ± 2. 73	0. 542
Socio-Economic Status	Middle	Middle	
Education (Years)	>12 Years	>12 Years	
Serum Albumin(gm/dl)	4.36±1.01	3.03±0.56	0.001

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

Table 2: Comparision of neuropsychological test in group 1 & group II

Neuropsychological Test	**Group 1(n=50)**	**Group 2 (n=50)**	**p-Value**
RAVLT-Total Score	38.76 ±9.81	43.83±10.07	0.000
RAVLT-Average Score	7.88±1.99	8.98±2.02	0.000
RAVLT-Immediate Recall	6.99±3.07	7.98±2.81	0.000
RAVLT-Delayed Recall	7.39±3.18	9.49±3.44	0.000
CFT-Copy	29.18±5.70	29.45±6.69	0.447
CFT-3 Minutes	10.43±5.38	11.99±5.79	0.010
CFT-30 Minutes	9.66±4.86	11.81±5.69	0.001
Spatial Span-Forward	7.32±1.49	7.80±1.53	0.004
Spatial Span-Backward	5.21±1.83	5.58±1.82	0.035
Digit Span-Forward	7.90±1.52	7.79±1.33	0.903
Digit Span-Backward	5.09±1.54	5.29±1.19	0.400

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

RESULTS

Table I demonstrates that subjects in both Group 1 and Group 2 had no statistically significant differences in the age and sex distribution. Revised Kuppuswami's scale was used for determining socio-economic status of the two groups. Both the groups had the subjects from middle socioeconomic group and no significant difference was observed in number of year of education but significant difference was observed between the Group I and Group II when level of albumin was taken into consideration.

Group I had significantly better scores on following variables; RAVLT: Total, Average, immediate recall and delayed recall scores; CFT: 3minutes and 30 minutes; WMS-spatial span-forward and backward compared to Group II as shown in Table: 2

DISCUSSION

Cognitive impairment contributes to decrease quality of life, increased neuropsychiatric symptoms, and increased disability [22, 23], as well as increased health care costs [24, 25]. It has an age-related prevalence

so that approximately five per cent of persons over the age of 65 residing in the community will suffer from significant cognitive impairment; by the age of 80 years the figure exceeds 20%.

There are three principle reasons for detecting cognitive impairment. The first is to determine whether a cause could be present that may be amenable to treatment. The second is to determine whether changes are occurring over time that may reflect an improvement or worsening of the underlying condition or dementia. The final reason is to support prognostication and long-range planning. [26] When cognitive impairment is discovered in an older person, the cause should be sought and where possible, corrected.

The aim of the present study was to examine whether there is any difference in the cognitive function among the elderly persons who had normal albumin level compared to those who have lower serum albumin level.

The results of this study suggest that a lower serum albumin concentration in healthy elderly male was associated with cognitive impairment which is consistent with a number of case control studies linking low levels of serum albumin with cognitive impairment [7, 8] and dementia [9, 10] but the difference being that their study was undertaken in subjects who were suffering from Alzheimer's disease, Heart failure and elderly hip fractured patient on prolonged bed rest.

Dik and colleagues observed a border line association with the MMSE, but observed no significant associations with Information-processing speed, immediate recall, delayed recall or fluid intelligence [11]. In yet another study by Ravaglia and colleagues found no association between levels of cognitive function and serum albumin in cognitively normal subjects at single-centre, [27] but the effects of the cognitive homogeneity or geographically limited nature of the population they studied are unclear.

We considered memory impairment but test primarily related to attention, orientation and executive functions, would be informative to examine the association between serum albumin and cognitive deficits

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Conflict of Interest: None

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Effect of Interathecal Fentanyl on the Characteristic of Spinal Anesthesia for Caesarean Section

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ABSTRACT

The study was conducted to analyze the effect of intrathecal fentanyl on the characteristics of spinal anesthesia for caesarean section. The study was conducted over 60 selected uncomplicated full term pts. admitted for caesarean section. In group A-20 Pts. were given 15 μgm fentanyl with bupivacaine.

In group B 20 Pts. were given 20 μgm fentanyl with bupivacaine.

GroupC was taken as control where 20 pts were given normal saline with bupivacaine.

Onset and duration of sensory blockade, onset and duration of motor blockade, neonatal outcome, general condition of pt. and side effects if any were noted.

Onset of sensory blockade was almost similar in all the groups while the duration of sensory blockade was prolonged in fentanyl group and slightly more so in group B where more dose of fentanyl was used. The onset and duration of motor blockade was not affected.

Sensory side effects of opiod anesthetics such as respiratory depression (both in mother & fetus) which are common with morphine were also rare with fentanyl. Minor side effects such as nausea are seen. The combination therefore appears to provide prolonged analgesia with minimal side effects. Opioids and local anesthetics have a synergistic effect and potentiate afferent sensory blockade thus providing acceptable surgical anesthesia without prolonging recovery. Rest of the parameters were also not effected. It was concluded that intrathecal fentanyl when added to bupivaeaine has an additive effect.

Keywords- *Pain, spinal anesthesia, caesarean section, fentanyl*

INTRODUCTION

Relieving pain is the most benevolent aspect in treatment of a patient. However relief of pain in medicine has remained illusive of complete solution for a long time. The relief of pain during caesarean section is one of the primary aim of anesthesiologist and the emotional responsibility of the gynecologist. The clinician is pertinent to observe that any expertise acquired in this field should be extended in to the post operative period also. Control of pain still constitutes a major challenge to all the physicians concurred with care of mothers Several methods such as use of analgesic drugs, specific nerve blocks and regional anaesthetic techniques have been practiced in the management of pain during caesarean section. Over the last few decades there has been a rapid advancement in the field of regional anesthesia. With better anatomical understanding and upcoming local anaesthetic pharmacology the advantages of spinal and epidural anaesthesia have been studied in depth. In spinal anaesthesia, though local anaesthetic initially evoked great enthusiasm but they often fell short of achieving optimum patient comfort without compromising safety due to their toxicity.Opiods alone were also found wanting. An opiod local anaesthetic combination used for centroneuraxis

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block provides various advantages. The introduction of fentanyl synthetic lipophilic potent opiod which is less toxic than morphine, was therefore a significant step.

In casarean section, fentanyl has been found to prolong the duration of analgesia. Opiod and local anesthetics have a synergistic effect and potentiate afferent sensory blockade thus providing acceptable surgical anaesthesia without prolonging recovering.

The study aimed at deterring the prolongation of pain relief and the safety of this drug combination when used in caesarean section.

MATERIALS AND METHOD

A total of 60 patients (age group 18-35 years) belonging to ASA grade I or II admitted to the hospital for caesarean section were selected for this study and randomly assigned to three different groups A,B and C.

Exclusion criteria-Patients with eclampsia, height less than 150 cm, weight more then 100 kg., evidence of foetal compromise and all contraindications of spinal anaesthesia.

The procedure was explained to the patient and informed consent was obtained from all the patients during preoperative checkup.

All the patients were kept fasting for 8 hours and the bladder was voided before the patient was brought to the theatre.

1000 ml of ringer lactate was administered as preloading in each patient. The patient was put on left lateral position and a 25 gauze spinal needle was introduced in L3-4 space midline using aseptic technique. Subarachnoid space was confirmed by free flow of cerebrospinal fluid. The study solution was injected and the time was noted. After injection the subject was immediately made supine with a slight head down tilt.

All the subjects were divided into 3 groups each consisting of 20 patients. The regimen was a follows.

Group A-Intrathecally - 2.5ml 0.5% Bupivacaine hyperbaric + 0.3 ml (15 μgm) fentanyl

Group B-Intrathecally - 2.5ml 0.5% Bupivacaine hyperbaric +0.4ml (20) μgm fentanyl

Group C-Intrathecally - 2.5ml 0.5% Bupivacaine hypebaric +0.3 ml normal saline

PARAMETERS MONITORED

Preoperative recording of blood pressure, oxygen saturation, pulse rate, respiratory rate, sedation requirement was done. Onset of sensory block, duration of sensory block, onset of motor block, duration of motor block, apgar score were noted. Adverse effects such as nausea, vomiting, pruritus and somnolence were also noted.

RESULTS

The groups were similar in terms of demographic data. Mean age in group A was 24.46 ± 4.42 years, in group B was 26.23 ± 5.19 years and in group C was 26.42 ± 5.83 years.

TABEL-1

Mean onset of sensory block after intrathecal injection and duration of pain relief after intrathecal injection.

Variables	Gr. A	Gr. B	Gr. C	A Vs B		B Vs C		A Vs C	
	Mean ±SD	Mean ±SD	Mean ±SD	"t"	"p"	"t"	"p"	"t"	"p"
Onset of sensory block After intrathecal injection	5.20 ±0.74	5.41 ±0.81	5.48 ±0.63	0.86	>0.05 NS	0.31NS	>0.05NS	1.29NS	>0.05NS
Duration of pain relief After intrathecal injection	196.7 ±45.1	202.4 ±62.4	130.2 ±41.2	0.33	>0.05 NS	4.32	<0.001 S	4.85	<0.001 S

Ns-non Significant

The values represented in table I shows that mean onset of sensory block at T6 level occurred at 5.20 ± 0.74 minutes in group A, 5.41 ± 0.81 minute in group B and 5.48 ± 0.63 minutes in group C. There was no significant difference in the time of onset of block in the different groups.

The duration of surgical anaesthesia as well as pain relief in the immediate post operative period was significantly prolonged in group A and B where Fentanyl was added. The mean duration of pain relief in group A where 15 μgm of Fentanyl was added to 2.5ml of bupivacaine (hyperbaric) was 196.70 ± 45.1 minutes and in group B where 20 μgm of Fentanyl was added to Bupivacaine (Hyperbaric) was 202.40 ± 62.4 minutes. Whereas in group C where normal saline 0.3ml was added to Bupivacaine (hyperbaric) was 130.20 ± 41.20 minutes.

TABEL-2

Mean onset of motor block after intrathecal injection and duration of motor block after intrathecal injection.

Variables	Gr. A	Gr. B	Gr. C	A Vs B		B Vs C		A Vs C	
	Mean ±SD	Mean ±SD	Mean ±SD	"t"	"p"	"t"	"p"	"t"	"p"
Onset of motor block After intrathecal injection	3.86 ±0.61	3.61 ±0.74	3.69 ±0.79	1.17	>0.05 NS	0.34	>0.05 NS	0.76	>0.05 NS
Duration of motor relief After intrathecal injection	189.88 ±49.20	182.16 ±36.41	178.91 ±51.22	0.56	>0.05 NS	0.23	>0.05 NS	0.69	>0.05 NS

Ns-non Significant

The data represented in table II shows there was no difference in the onset of motor block in group A, B and C. Onset of motor block was achieved at 3.86 ± 0.61 minute in group A 3.61 ± 0.74 in group B and 3.69 ± 0.79 minutes in group C. There was also no difference in the duration of motor block.

DISCUSSION

Advances in pain management have led the clinician & the anaesthetist to think over on the relief of pain during caesarean section & extending the benefit to post operative period. Since ages opiods have been considered as potent analgesics but adding to less advantage due to their adverse effects. Bupivacaine alone when used for spinal anaesthesia for caesarean section gives adequate sensory loss but the advantage cannot be extended to the post operative period. When fentanyl is added to bupivacaine it not only increases the duration but also the quality of sensory block.

In the spinal cord, dull burning pain is transmitted by slowly conducting nonmyelinated C fibers while sharp well localized pain is transmitted by fast conducting A delta fibers. According to a study conducted by Wang.C.et al[1] on animal models opiod injected into the centroneuraxial system act by inhibiting synaptic transmission in the A delta and C fibers, by opening presynaptic potassium channels to inhibit calcium influx and thus reduce transmitter release. There is also direct post synaptic hyperpolarisation and reduced neuronal activity (Dickenson A.H. et al[2]) and yet no inhibition of sympathetic conduction or somatosensory evoked potential. Local anaesthetics like bupivacaine primarily block voltage gated sodium channels in the axonal membrane and possibly by additional presynaptic inhibition of calcium channels. Synergistic blockade of A delta and C fibers by opiods probably allows the maintenance of surgical anaesthesia long after regression of local anaesthetic induced sensory blockade. Prolonged analgesia is due to blockade of nociceptive transmission by A delta and C fibers.

The purpose of this clinical trial was to evaluate the efficacy of Intrathecal fentanyl when added to

Bupivacaine for spinal anaesthesia for caesarean section.

In Table 1 we observed the effect of fentanyl on duration of pain relief. The duration of pain relief is increased when fentanyl is added to Bupivacaine and more so with 20 μgm of fentanyl. Similarly Thomas H et al[3] when used 100 μgm fentanyl with 8 ml. of 0.5% Bupivacaine for epidural analgesia in caesarean section there was significant prolongation of duration of pain relief.

Visceral Pain which is residual with bupivacaine was abolished with fentanyl. Our findings corresponded to study by Choi et al[4]. Pederson et al[5] also observed the reduction of visceral pain.

Idowu OA, Sanusi AA, Evelade OR[6] observed that addition of fentanyl to Bupivacaine intrathecally for elective caesarean section increases the duration of complete and effective analgesia thereby reducing the need for early post operative use of analgesics. Biswas et al[7] also found that fentanyl when used with hyperbaric bupivacaine improved analgesia during caesarean section & in early postoperative period

When we study about the duration of motor blockade we observe that fentanyl does not effect the duration of motor blockade

E Sheikh et al[8] Similarly observed that the combination group prolongs the duration of sensory spinal block, increases the duration of analgesia without increasing the duration of motor blockade and does not cause any significant side effects and provides stable hemodynamic conditions without foetal or maternal compromise.

This study demonstrates that addition of 15-20 μgm of Fentanyl intrathecally significantly increases the duration and quality of sensory block caused by Bupicacaine alone with out prolonging motor or autonomic block. .

Adverse effects such as pruritus, nausea, vomiting and somnolence were observed more commonly in group B as compared to group A.

CONCLUSION

use of intrathecal fentanyl as an adjunct to local anaesthetic considerably enhances the efficacy of subarachnoid block, without prolonging recovery or any unbearable side effects. However increasing the dose of fentanyl from 15 to 20 gm does not significantly enhance the quality of block, while incidence of side effects may rise.

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Effect of Automobile Spray Painting on Lung Function

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ABSTRACT

Automobile spray painting is one among the occupational exposure, which is associated with isocyanates induced Occupational Asthma. This study is undertaken to assess the risk of developing Occupational Asthma in automobile spray painters.

Objective: To compare the pulmonary function test between automobile spray painters and non painters.

Methods: 30 male automobile spray painters and 30 male non painters were taken up for the study with consideration of inclusion and exclusion criteria. All subjects were evaluated for lung function parameters by using hand held Spirometer. The collected data was compiled and statistically analysed.

Results: Decline in FVC was moderately significant with P value 0.02 while decline in FEV1, FEV1/ FVC ratio, FEF 25-75 and PEFR values were strongly significant P value <0.001 in spray painters when compared to non painters.

Conclusion: Chronic exposure to automobile spray painting resulted in significant decline in lung function when compared to controls with results suggestive of mixed airway disorder with more of obstructive type. Hence it is recommended that automobile spray painters should be provided with personal protective equipments and regular medical surveillance programmes.

Keywords *- Automobile spray painting, Occupational Asthma, Pulmonary function test*

INTRODUCTION

Occupational asthma (OA) is the most common occupational lung disease in industrialized countries. Up to 15% of all adult asthma is attributable to OA. (1) It is a respiratory disorder characterized by bronchial hyperreactivity caused by agents present in the air at the workplace which causes obstruction or inflammation of the airway and is partially or totally reversible through treatment. (2) Automobile spray painting is one such occupation, found to be the most commonly identified cause of occupational asthma in most industrialized countries. (3)

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Colour of the car is the first thing we see when we get into our car and the last thing we see when we leave our car. Most importantly, it is the single largest factor used to select car .Nowadays painting an automotive is done through spray painting. Spray painting is a technique of painting whereby a coating of paint is sprayed via a device onto the surface. These paints contains various potentially toxic materials, including isocyanates, epoxy resins, metal pigments, silica fillers, and organic solvents. Polyurethane paints containing isocyanate hardeners were introduced in the automobile refinishing market in the late 1960s to provide resistance to weather and sunlight, it came into wider use since 1980.

Studies have shown that workplace exposure to polyisocyanates,which are low-molecular-weight compounds used in the manufacture of polyurethane paints, varnishes and plastics may lead to respiratory

impairment.[1-3] There is evidence of Work related Asthma (WRA) among spray painters due to exposure to isocyanate-based aerosol paints.[4]

According to the European Community Respiratory Health Survey classification, spray painting is considered an occupation with a high risk of respiratory impairment and asthma. [4, 5] Despite the acknowledged risk, widespread use of isocyanates in the paint systems used in automotive repair and refinishing industry still entails exposure. Hence, this study aims to assess the lung function in Indian automobile spray painters without protective measures and educate them regarding safety measures which has to be adopted.

OBJECTIVE

To record pulmonary function test parameters in automobile spray painters and controls and to compare the results for significance.

MATERIALS AND METHOD

A comparative parallel study was conducted among 60 healthy non smoking males with age group 18-40 years in and around Tumkur city belonging to different socio-economic strata of the society . The study comprised of 30 male automobile spray painters and 30 male non painters.

After obtaining a written informed consent the general physical examination was done and the PFT procedure was explained and demonstrated. The 2 groups were age, gender & BMI matched and the subjects were made to perform spirometry after application of nose clips using Spirothor hand-held Spirometer. Three spirometry recordings were obtained and the best out of the three was taken into consideration.

EXCLUSION CRITERIA

Diabetes, Hypertension, Smoking, Alcohol consumption, Cardio-Respiratory System illness

STATISTICAL ANALYSIS

The data was analyzed using SPSS 15 software and Descriptive statistical analysis were carried out and the results were presented in Mean ± SD, Student t test with P value < 0.05 –was taken as significant and the results were expressed in tables.

FINDINGS

Table 1: Comparison of Age & BMI in spray painters and non painters

Variables	Painters	Non Painters	P- Value
Age yrs	24.93±4.65	24.16±7.42	0.316
BMI Kg/m2	22.08±2.40	22.39±2.94	0.328

P value not significant

Table 2: Comparison of PFT values in automobile spays painters and non painters.

PFT	Painters	Non Painters	P- Value
FVC Lt	3.35±0.77	3.74±0.77	0.02*
FEV1 Lt	2.78±0.72	3.30±0.55	<0.001**
FEV1/FVC	82±0.09%	91±0.08	<0.001**
FEF25-75 Lt	2.44±1.16	4.36±1.33	<0.001**
PEFR Lt/s	4.60±1.66	7.51±1.60	<0.001**

* Significant (P value: P< 0.05), **strongly significant (P value: P < 0.01).

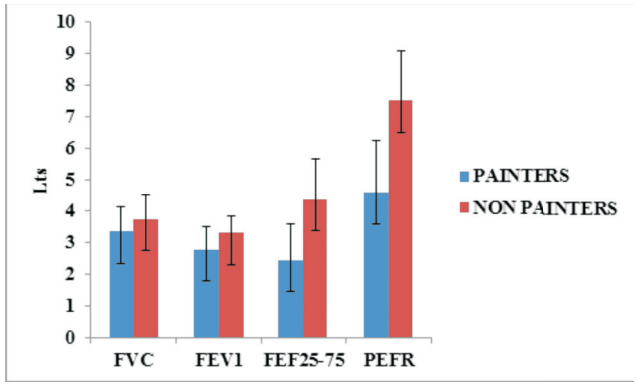

Fig 1: Graph showing PFT values in automobile spay painters and non painters

Table 1 shows age and BMI are matched among spray painters and non painters. PFT parameter FVC was moderately reduced while FEV1, FEV1/FVC, FEF 25-75 and PEFR values were strongly reduced in painters when compared to non painters.

DISCUSSION

The PFT values FVC, FEV1, FEV1/FVC, FEF 25-

75 and PEFR were significantly lower in automobile spray painters when compared to non painters. FEV1 was more significantly reduced when compared to FVC with reduction in FEV1/FVC ratio. These findings are suggestive of mixed airway disorder with more of obstructive type.

The most commonly used isocyanates in automobile spray paints are toluene diisocyanate (TDI), methylene diphenyl diisocyanate (MDI) and hexamethylene diisocyanate (HDI). The risk of exposure depends on the volatility of the compound and the application process. Mechanism by which isocyanate induces respiratory disorder is explained by three main physiological origins.

PHARMACOLOGICAL THEORY

The pharmacological theory suggests increased beta-adrenergic blockade. [6] Davies el al. have suggested that isocyanates reduce the ability of beta adrenergic receptors to produce cyclic adenosine monophosphate in sufficient amounts to maintain bronchial tone.[7] Hence these result in a chronic irreversible dysfunction of autonomic control of bronchial tone, or a hyper-reactivity of bronchial smooth muscle.[8]

IRRITATIVE THEORY

The disaster which occurred at Bhopal, India in December 1984, tragically confirmed the acute toxicity of isocyanates. Acute toxicity causes increased chemotaxis and random migration of eosinophils and neutrophils, which may result in rapid coagulation and necrosis of the bronchial epithelium leading to occlusion of bronchioles by necrotic tissue, inflammation and edema. In fact, this inflammatory cell reaction is non-specific for isocyanate-induced asthma. [6]

IMMUNOLOCICAL THEORY

Several immunological mechanisms may be involved. Isocyanates combine covalently with body proteins to form hapten-protein conjugates.[6] Isocyanate-specific IgE, IgG, IgM antibodies may be produced in patients sensitized to isocyanates.[9,10] T-cell mediated mechanism is characterized by an acute inflammatory reaction with infiltration of the bronchial mucosa by neutrophils, eosinophils and mononuclear cells resulting in hyperresponsiveness of airway.[6]

All these mechanism may act separately or simultaneously and their presence varies with individual patient and occurrence of exposure.

CONCLUSION

Chronic exposure to automobile spray painting resulted in significant decline in lung function compared to controls with results suggestive of mixed airway disorder with more of obstructive type. Thus, it is associated with a high risk of work related obstructive respiratory pathology due to chronic dysfunction of autonomic control of bronchial tone, inflammation and hypersensitivity. Hence it is recommended that automobile spray painters should be provided with personal protective equipments and regular medical surveillance programmes.

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Assessing the Vulnerable Stress Level of Hosteller and Day Scholars of a Medical College

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ABSTRACT

Background : Stress is the fact of medical education. Especially the First Year M.B., B.S. students are exposed to a greater physiological stress as they come across challenges like vast syllabus, social isolation, repeated examinations, high expectations from teachers and parents.

In addition, the stay in the hostel as compared to the homes as it's own advantages and drawbacks.

Aims and objectives: to assess stress levels of hosteller and day scholars of a medical college.In this study, we analysed the results of the General health Questionnaire and the blood pressure variations among hosteller and day scholar first year medical students before and during examination.
Materials and Method: 150 (100 males and 50 females) first year medical students, one month before and during examinations, were given the GHQ questionnaire. Their blood pressure was also recorded on both the occasions.

Results: The study revealed significant increase in GHQ stress levels in both hostellers and day scholars one month before and during exams. Whereas there was no significant difference in stress levels among hostellers and day scholars.

The same results reflected upon male and female hosteller students except that male hostellers showed higher systolic BP during exams.

Conclusion: -The study confirmed the general impression that there is a considerable amount of stress among the medical students with no significant difference between the hostellers and day scholars. Stressors in campus and in hostels should be identified and necessary interventions to reduce stress are highly recommended.

Keywords*: academic examination stress, hosteller, day scholar, first year medical students.*

INTRODUCTION

Stress is a complex, dynamic process of interaction between a person and his or her life. It is the war one reacts physically, mentally and emotionally to the various conditions.[1]

Examination stress is a feeling of pressure tension that many young medical students feel during the revision period, before examinations and immediately before and during the examinations. Many students perceive stress during such academic examination time. And the first year medical students are considered as a unique group due to first exploration in medical science, peer pressure and competition, expectations from staff and parents, change in environment, change in languages, uncertainty of oral and practical examinations, limitation of students to cope and so many other factors. Though moderate amount of stress is essential for maintaining motto for better performance and preparation in examination, extreme stress can be harmful to body and mind. [2]

The stay in the hostel as compared to the homes as it's own advantages and drawbacks.

Some studies reveal that students staying in the hostel have greater stress as there is a huge change in the environment as there is less privacy, sleep deprivation, poor facilities, ragging by seniors,

home sickness and social and cultural shock. The responsibilities increase drastically as there is burden of self-management including health care and money management. [3, 4, 5]

In contrary few studies have concluded that students staying in hostel have better emotional maturity, leadership qualities, sociability and better coping skills to stress as compared to day scholars. [6]

Aims and objectives: Hence the present study was aimed to assess the stress levels before and during academic examination among hostellers and day scholars in first year medical students and to correlate stress levels with blood pressure.

MATERIALS AND METHOD

This study was carried out at Bangalore Medical College &Research Institute, Karnataka, India, in a period of 2013-2014. It was a cross-sectional study carried out with 150 first year exam going medical students following Institutional Ethical Committee approval. Male students were aged 18.72±0.83 years & female students were aged 18.62±0.67 years.

Initially, informed consent document were sought from the students who were willing to participate in this study. General health questionnaire was distributed to all the students. Physical examination was carried out and Blood pressure (BP) was measured using sphygmomanometer. The GHQ-12 Questionnaire administration and BP recording were done on two occasions that is one month before and during final first year academic exams.

The 12-Item General Health Questionnaire (GHQ-12) (Goldberg & Williams, 1988) [7] consists of 12 items, each one assessing the severity of a mental problem over the past few weeks using a 4-point Likert-type scale (from 0 to 3). The score was used to generate a total score ranging from 0 to 36. The positive items were corrected from 0 (always) to 3 (never) and the negative ones from 3 (always) to 0 (never). >13 – mild stress,>20 - moderate stress

> 30 – severe stress which indicate worse health.

Statistics: The statistical analysis was done by using the Student's unpaired 't' test.

Statistical software: The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1 ,Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

Table 1: GHQ: A comparative evaluation

GHQ	Before examination	During examination	difference	t value	P value
Male	12.78±5.73	17.73±7.22	4.950	17.928	<0.001**
Female	15.82±5.29	20.54±7.11	4.720	12.416	<0.001**
P value	0.002**	0.025*	-	-	-

Table 2: GHQ A comparative evaluation in male subjects

GHQ	Before examination	During examination	difference	t value	P value
Localite	13.78±4.85	19.00±6.07	5.222	13.732	<0.001**
Hostel	12.22±6.13	17.02±7.74	4.797	12.776	<0.001**
P value	0.193	0.188	-	-	-

Table 3: SBP (mm Hg): A comparative evaluation in male subjects

SBP (mm Hg)	Before examination	During examination	difference	t value	P value
Localite	107.00±8.82	116.72±8.96	9.722	12.253	<0.001**
Hostel	103.91±7.54	112.84±6.74	8.938	19.584	<0.001**
P value	0.067+	0.016*	-	-	-

Table 4: DBP (mm Hg): A comparative evaluation in male subjects

DBP (mm Hg)	**Before examination**	**During Examination**	**difference**	**t value**	**P value**
Localite	66.72±5.45	74.11±6.20	7.389	10.580	<0.001**
Hostel	66.94±5.09	75.22±4.93	8.281	18.890	<0.001**
P value	0.844	0.329	-	-	-

Table 5: GHQ : : A comparative evaluation in female subjects

GHQ	**Before examination**	**During examination**	**difference**	**t value**	**P value**
Localite	16.46±4.65	21.21±6.07	4.750	9.037	<0.001**
Hostel	15.23±5.84	19.92±8.03	4.692	8.427	<0.001**
P value	0.418	0.529	-	-	-

Table 6: SBP (mm Hg): : A comparative evaluation in female subjects

SBP (mm Hg)	**Before examination**	**During examination**	**difference**	**t value**	**P value**
Localite	105.92±6.86	113.50±7.96	7.583	10.651	<0.001**
Hostel	107.62±5.54	114.31±6.29	6.692	11.024	<0.001**
P value	0.339	0.691	-	-	-

Table 7: DBP (mm Hg) : A comparative evaluation in female subjects

DBP (mm Hg)	**Before examination**	**During examination**	**difference**	**t value**	**P value**
Localite	67.58±5.17	74.00±5.93	6.417	10.077	<0.001**
Hostel	67.77±5.64	72.77±6.35	5.000	9.555	<0.001**
P value	0.904	0.483	-	-	-

Table 1 shows statistically significant increase in stress levels as indicated by GHQ scoring in male and female students during exams as compared to one month before exams but mildly significant difference between male and female students (female students showing higher stress levels both before and during exams when compared to male students)

Table 2 shows statistically significant increase in stress levels as indicated by GHQ scoring in male hosteller and day scholar students during exams as compared to one month before exams but no significant difference between male hosteller and day scholar students.

Table 3 & 4 shows statistically significant increase in systolic and diastolic blood pressure in male hosteller and day scholar students during exams as compared to one month before exams but only significant increase in systolic BP in male hosteller during exams.

Table 5 shows statistically significant increase in stress levels as indicated by GHQ scoring in female hosteller and day scholar students during exams as compared to one month before exams but no significant difference between female hosteller and day scholar students.

Table 6 & 7 shows statistically significant increase in systolic and diastolic blood pressure in male hosteller and day scholar students during exams as compared to one month before exams but no significant difference between female hosteller and day scholar students.

DISCUSSION

Medical education is stressful as there is lot of uncertainty in course, examination, results and future. Minimal amount of stress is necessary for growth and is essential for sound personal functioning. On the other hand the increase in the level of stress is associated with decrease of psychological health which may impair student's behaviour, diminish learning and ultimately affect patient care.[3]

The negative effects of long and tiring medical education on the psychological status of students have been shown in several studies and our results were in consensus with them. The changes appear to be significant during first year. Therefore, with early identification and effective psychological support, possible future illness may be prevented .[8]

In Medical colleges, only candidates with excellent academic attainment can successfully enter. Therefore, the medical program is even more competitive and stressful for students who are accepted.[9]

The present study confirmed the general impression that stress is common in medical schools. As per the GHQ scoring the first year students of our medical college, both hostellers and day scholars showed significant increase in stress levels both before and during exams.

In particular female students were more stressed compared to male counterparts. This is in consensus with the study conducted Zung w.w.k.: Self rating depression scale by which showed that girls had more stress compared to boys.[10]

In a studies conducted by Chandrashekhar et al in Nepal [11]and Abraham et al in Manipal[13] prevalence of stress was 20.9% and 37.3% respectively.

Sidik et al in Malaysia [9] and Ko et al in Singapore[13] reported higher prevalence of stress, i.e. 41.9% and 57% respectively.

Examination is stressful event as it is evident and necessary to work hard to remember and recall a large amount of information for an examination. Over and above there is always an uncertainty of result of examination with fear of parental and peer pressure due to competition.

Stowell (2004) had revealed that the stress level in medical students is increased during academic examination and that can lead to different psychological and immunological consequences[14].

The present study also showed that there was significant difference in vital parameters (Systolic Blood Pressure and Diastolic Blood Pressure) due to academic examination.

Faiyaz Qureshi et al (2002) had also concluded that academic examinations in medical students are stressful enough to produce changes in blood pressure and blood cells parameters[15].

In our institution, some of the students were from outside Bangalore and were staying in hostel. As compared to home, hostel life is a huge change in

the environment and it became difficult for students to adjust in this environment. Such environment may bring cultural shock to some extent as they come from different social and cultural background.

The other important psychosocial factors linked to staying in hostel are "quality of food in the mess, lack of recreation, feeling of loneliness and worrying about the future".[11] Earlier studies have reported that psychosocial factors are important sources of stress for medical students. These factors were associated significantly with high GHQ-12 scores. Similarly the results of our study showed increased stress levels as indicated by GHQ scoring among male and female hostel students. Also our study revealed significant increase in both systolic & diastolic BP of male & female hosteller students before and during exams. There was also an increase in systolic BP in male hosteller students as compared to day scholars.

Coping skill training may be a useful intervention to lessen the negative effects of stress among medical students. It was reported that the type of adaptive or maladaptive coping skill developed during medical school may have consequences for long term professional adaptation or impairment [16] . Hence it is essential to take corrective steps at the beginning of the medical under graduations to develop and inculcate adaptive coping skills in the medical students during their formative years.

The guideline has stated that there are no standards for coping strategies that might vary depending on socio cultural factors. Thus, coping strategies have been shown to vary by region, community, social groups, households, gender, age, season and time. This is greatly

Influenced by individual's personal experiences[17].The main coping strategies which were adopted were, talking to family members or friends (41.1%), sleeping (16%), watching TV/movies (12.6%) and listening to music. 47.2% students felt a need for professional help during stress[18]. Students should be encouraged to participate in sports and extracurricular activity and to enrich their hobby. Seniors should be counselled against ragging. They should be encouraged to flourish healthy interactions with colleagues.

There should be functional parent counselling cell because parents should be counselled in order to avoid their over expectations about their kids. In medical school, to score and remain at the top of the class is difficult as compared to scoring in secondary school.

The interventions which have to be implemented in the campus are providing social and psychosocial support, stress reduction and relaxation methods, and individual counselling techniques. We recommend encouraging the college faculty and the staff to work in collaboration with the students to develop and implement the appropriate support services for the students.

Appointing a full time counsellor is necessary towards early identification of stressors in the students' life. All students must participate in some form of stress reducing activities. Regular monitoring and evaluation of students is necessary in terms of academic performance, getting involved in social circles and participation in extracurricular activities. There should be a good communication between students and teachers or faculty members. There should be a parent/guardian faculty member meet on regular basis in order to know the progress of student

CONCLUSION

The study confirmed the general impression that there is a considerable amount of stress among the medical students with no significant difference between the hostellers and day scholars. It was also reflected that the stress was more in girls as compared to boys. The main stressor was related to academic examinations.Stressors in campus and in hostels should be identified and necessary interventions to reduce stress are highly recommended.

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Changes in Blood Leucocyte Count in Different Trimesters of Pregnancy

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ABSTRACT

Aims and Objective: Normal pregnancy involves many changes including alterations in hematologic parameters. These hematologic changes include changes in total leucocyte count and differential leucocyte count during pregnancy. Therefore in the present study, the changes in total leucocyte count and differential leucocyte counts are studied in the pregnant women in different trimesters of pregnancy.

Materials and Method: 30 pregnant women in the age group of 20 to 30 were enrolled for the study. Total leukocyte count and differential leucocyte count were measured on samples of blood obtained from each consenting participant during each of the three trimesters. The results were analyzed using SPSS for windows (Version 11) and the data expressed as means ± S.D. Means were compared using the student's paired *t-test*.

Results: Total leucocyte count and differential leucocyte count were compared with each other between trimesters and none of the values were found to be statistically significant. ($p>0.05$)

Conclusion: The total leucocyte count rises progressively during pregnancy. The increased total leucocyte count in third trimester may be caused by the increased level of estrogen and cortisol hormone. The increase in leucocyte count is largely due to increase in circulating segmented neutrophils. In labor the leucocyte count is even more and count is highly correlated with labor progression as determined by cervical dilatation. One more cause may be reappearance of leucocytes previously shunted out of active circulation.

Key words: *Total leucocyte count, Differential count, Pregnancy*

INTRODUCTION

Pregnancy is process whereby the life of a baby begins in the mother's womb and progresses up to the stage when it is safe to expose the baby to the outside world. During pregnancy there is progressive anatomical, physiological and biochemical changes not only confined to the genital organs but also to all systems of the body. As the pregnancy progresses, various types of extra demands are imposed on the mother's body by the growing fetus, which are met with by certain adaptations in almost all the organ systems of the body[1].

Normal pregnancy involves many changes in maternal physiology including alterations in hematologic parameters. These changes include expansion in maternal blood and plasma volumes and a decrease in hematocrit, as well as an increase in the levels of some plasma proteins that alters the balance of coagulation and fibrinolysis[2].

First trimester includes first 12 weeks .Second trimester includes 13 to 28 weeks. Third trimester includes 29 to 40 weeks

Therefore the present study is undertaken to assess the changes in leucocyte count during different trimesters of pregnancy.

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AIMS AND OBJECTIVES

- To estimate total leucocyte count and differential leucocyte count during different trimesters of pregnancy
- To compare the variations observed in total leucocyte count and differential leucocyte count during different trimesters of pregnancy.

MATERIALS AND METHOD

This study was conducted on 30 normal healthy pregnant women with age group of 20 to 30 years.

This study was performed from March 2013 to march 2014 in the physiology department, with lab assistance from department of pathology, BMC, Chitradurga.

Ethical committee, BMC, Chitradurga , has approved this study to conduct in the department of physiology, BMC, Chitradurga.

Source of Data: Subject- Study group consists of 30 pregnant females aged between 20-30years in and around Chitradurga.

Inclusion Criteria

1. Healthy women in reproductive age groups.
2. They should not have anemia, blood disorders.
3. Women aged 20-30 years

Exclusion Criteria

H/o gynaecological disorders

H/o bleeding disorders

H/o diabetes mellitus, gestational diabetes

OBSERVATIONS AND RESULTS

Total leucocyte count and differential leucocyte count of 30 normal healthy pregnant women (aged between 20-30 years) were studied during different trimesters of Pregnancy results were analyzed by applying student's paired "t" test

Total leucocyte count (cells/cu mm) and differential leucocyte count (%) over the three trimesters in pregnant women (Mean ± SD)

Parameters	Trimester1	Trimester 2	Trimester3	P value		
				1st&2nd	1st&3rd	2nd &3rd
WBC	6220±1790	7520±2740	8110±4130	0.233	0.098	0.583
Neutrophil	55.17±9.24	48.97±17.96	55.32±12.17	0.277	0.980	0.266
Eosinophil	10.53±5.21	9.72±3.10	10.90±4.91	0.639	0.835	0.494
Basophil	1.00±0.00	-	-	-	-	-
Lymphocyte	33.64±23.94	31.38±14.75	27.36±18.36	0.165	0.845	0.113
Monocyte	1.82±0.67	0.85±0.43	1.37±0.77	0.318	0.601	0.591

DISCUSSION

The aim of this study was to evaluate the total leucocyte count and differential leucocyte count of pregnant women at different trimesters. Total leucocyte count and differential leucocyte count were compared with each other between trimesters and none of the values were found to be statistically significant

The total leucocyte count is increased in the third trimester compared to first and second trimester.

The peripheral white blood cell count rises progressively during pregnancy. The increase in the WBC count during pregnancy is largely due to increases in circulating segmented neutrophils and granulocytes whose absolute number is nearly doubled at term. The reason for increased leukocytosis may be caused by the elevated estrogen and cortisol levels[3].

Neutrophil numbers rise synchronously with the estrogen peak of an ovulatory menstrual cycle and if conception occurs continue to rise to peak at about 33 weeks after with their count stabilizes. The neutrophil number peaks during labor and in the early puerperium. Neutrophil metabolic activity

increases as does phagocytic function[4].

The number of eosinophils, basophils and monocytes in each milliliter of blood does not change significantly during pregnancy but with the increase in circulating volume, the total numbers of these cells are increased. Lymphocyte counts do not change but their function is suppressed[4].

In labor the count rises and counts are highly correlated with labor progression as determined by cervical dilatation. Because of the normal increase of the WBCs in labor, it should not be used clinically in determining the presence of infection[5].

England JM et al in 1976 studied that white cell counts rise during pregnancy with the occasional appearance of myelocytes or metamyelocytes in the blood[6].

Luppi et al (2002) studied that during third trimester the percentages of granulocytes and CD_8 T lymphocytes are significantly increased along with a concomitant reduction in the percentages of CD_4 T lymphocytes and monocytes. Moreover, circulating leukocytes undergo significant phenotypic changes including, for example, the upregulation of certain adhesion molecules[7].

Garfield et al (2006) studied that increasing number of immune cells are also found in uterine wall during normal pregnancy. They have also found that these cells, especially mast cells, may play an important role in mediating uterine contractility[8]

CONCLUSION

The total leucocyte count rises progressively during pregnancy. The increased total leucocyte count in third trimester may be caused by the increased level of estrogen and cortisol hormone. The increase in leucocyte count is largely due to increase in circulating segmented neutrophils. In labor the leucocyte count is even more and count is highly correlated with labor progression as determined by cervical dilatation. One more cause may be reappearance of leucocytes previously shunted out of active circulation.

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CONFLICT OF INTEREST

The authors declare they have no conflict of interest

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Effect of Acute Stress on Cardiac Output and Systemic Peripheral Resistance in Young Adult Medical Students

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ABSTRACT

Stress is major problem in population especially in young adult students in the present environment. Stress adversely affects almost all the systems of the body including cardiovascular system predisposing the individual at higher risk for development of hypertension and other cardiovascular diseases. The present study was conducted to assess the effect of acute stress on cardiac output and systemic peripheral resistance in young adult medical students. One hundred asymptomatic healthy male medical students, aged 17-25 years, participated voluntarily in the present study. Cold pressor test (CPT) was used to produce acute stress. Subjects were exposed to acute stress by standard procedure of CPT, i.e. immersion of hand in cold water of 8°c for 2 minutes. Blood pressure and heart rate were recorded by using automatic digital sphygmomanometer. Cardiac output, peripheral resistance and other cardiovascular parameters were recorded using Impedance Cardiovasograph (Nivomon). All the parameters were recorded before and immediately after cold pressor test. Results showed that there was significant increase in all cardiovascular parameters after exposure to acute stress in form of cold stress. Increase in diastolic blood pressure (DBP), heart rate (HR), systemic peripheral resistance (SPR) and systemic vascular resistance index (SVRI) were highly significant ($p<0.001$). while increase in systolic blood pressure (SBP), cardiac output (CO), stroke volume (SV), cardiac index (CI), stroke volume index (SI) were less significant ($p<0.05$).

Keywords: *Stress, Cold Pressor Test, Impedance Cardiovasograph, Cardiac Output, Systemic Peripheral Resistance*

INTRODUCTION

Stress is a common phenomenon and major problem in the present population. Today man is exposed to stress far greater level than any time earlier. Largely technical and economical advancements are responsible for it. The subjective state of sensing potentially adverse changes in the environment is called 'stress' and these adverse actual or potential disturbance of an individual's environment are called as stressors. Stressor is perceived by specific brain regions and release 'stress mediators', which bind to receptor targets. Each of these mediators acts on specific neuronal populations, resulting in unique downstream effects. Altogether, these effects constitute the 'stress response', which enables the person to adapt to the changing environment. Nature and intensity of the stressor and the response of the person varies. However all types of stressors of varying intensity stimulate sympathetic nervous system [1-3].

Cold stress test or cold pressor test (CPT) is an autonomic function test. Cold stimulus causes intense stimulation of sympathetic nervous system with release of nor- epinephrine and epinephrine. Cold pressor test has been used as diagnostic test to detect autonomic status in diseases like neuropathies, prediction of development of hypertension in people

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who are normotensive at present. During cold pressor test, the hand or foot is immersed in cold water bath held at a constant temperature at 8^0 C. Immersion in cold water activates afferent pain and temperature neurons which results in stimulation of sympathetic efferent neurons. Leblank first reported the use of cold pressor test in fishermen. Cold pressor test represents a wide spread neurogenic stimulation of multiple components of cardiovascular system [4-6].

Autonomic nervous system controls various visceral activities of body including blood pressure and heart rate. Blood pressure is directly proportional to cardiac output and peripheral resistance. Change in cardiac output and peripheral resistance is very good indicator of change in autonomic status. As they tend to increase with sympathetic stimulation and tend to decrease with increase in parasympathetic activity. Cardiac output is the product of stroke volume and heart rate. Peripheral resistance in the body in man is primarily controlled by the arterioles which are richly supplied with sympathetic fibers, but sparse parasympathetic innervations [7,8].

Cardiac output and peripheral resistance can be measured non invasively by using Impedance Cardiovasograph (Nivomon, L&T Medical's). It is a Non Invasive vasography monitoring system. It measures the Cardiac Output (CO) and Blood Flow Index (BFI) of the patient non-invasively. It computes the Cardiac Output (CO), Stroke Volume (SV), Systemic Vascular Resistance (SVR), Cardiac Index (CI), Stroke volume Index (SI), Systemic Vascular Resistance Index (SVRI), Pulse Rate (PR) and various other cardiovascular parameters [9, 10]. As the medical students face significant number of stressors in form of studies, homesickness, change in social environment etc, therefore the present study aims the to study the effect of acute stress on cardiac output and systemic peripheral resistance in young adult medical students.

MATERIAL AND METHOD

The present study was conducted in the department of physiology, Saraswathi Institute of Medical Sciences, Hapur. One hundred asymptomatic healthy male medical students, aged 17-25 years, participated voluntarily in the present study, undertaken, to assess the effect of acute stress on cardiac output and systemic peripheral resistance in young adult medical students. Experiment procedures were in accordance with the ethical committee on human experimentation. Study was carried out at ambient temperature with minimal external or internal sound disturbances in the room. Subjects reported to laboratory 2 hours after light lunch. They were explained in detail about the experimental procedure. Informed consent was taken from all subjects. Subjects were asked to lie in supine position and to take rest for 10 minutes. Systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) were recorded by using automatic digital sphygmomanometer. Subjects were connected to Impedance Cardiovasograph (Nivomon) via color coded 8 leads of NICO patient cable. Leads were connected at their respective locations as given below:

1. Red leads (I1 and I1′) -Behind the ears (Top pair)
2. Yellow leads (V1 and V1′) -Roof of the neck (Second pair)
3. Violet leads (V2 and V2′) -Level of xiphisternum (Third pair)
4. Green leads (I2 and I2′) End of ribcage or >5 cm from third pair (Bottom pair)

Cardiac output, peripheral resistance and other parameters were recorded using Impedance Cardiovasograph (Nivomon).

Subjects were asked to dip left hand in cold water at 8^Oc for two minutes. Above mentioned parameters were recorded again immediately after removal of hand from cold water.

All data were collected and statistical analysis was done by paired t-test using the window SPSS Statistics 17.0 version.

FINDINGS

Table -1: Baseline characteristics of all subjects Data are expressed as Mean±SD.

S.N.		
1	Age (in years)	20.4±3.2
2	Height (cms)	169.5±4.2
3	Weight (Kg)	60.5±5.3
4	BSA (m^2)	1.68±0.5

Table -2: Comparison of cardiac output and peripheral resistance and other cardiovascular parameters before and after Cold Pressor Test (CPT)

S.N.		Before CPT	Immediately after CPT
1	Systolic blood pressure (SBP) (mm Hg)	114.2±3.5	136.4±4.2*
2	Diastolic blood pressure (DBP) (mm Hg)	72.22±2.6	86.32±1.5**
3	Heart rate (HR) (per minute)	70.28±0.13	81.4±2.6**
4	Cardiac Output (CO) (L/min)	5.12±0.18	6.14±0.07*
5	Stroke volume (SV) (ml/ beat)	72.84±0.6	75.3.21±1.5*
6	Systemic Peripheral Resistance (SPR) (dyne.sec/cm^5)	1356.1±8.4	1398±16.4**
7	Cardiac Index (CI) (L/min/m^2)	3.02±0.07	3.62±0.06*
8	Stroke volume Index (SI) (ml/ beat/m^2)	43.11±0.02	44.56±0.03*
9	Systemic Vascular Resistance Index (SVRI) ((dyne.sec/cm^5/m^2)	768.5±13.5	794.5±14.1**

*p<0.05 (significant), **p<0.001(highly significant)

Table -2 shows comparison of parameters before and after cold pressor test. There was significant increase in all cardiovascular parameters after exposure to cold stress for two minutes. Increase in Diastolic blood pressure (DBP), heart rate (HR) , Systemic Peripheral Resistance (SPR) and Systemic Vascular Resistance Index (SVRI) were highly significant (p<0.001). while increase in Systolic blood pressure (SBP), Cardiac Output (CO), Stroke volume (SV), Cardiac Index (CI), Stroke volume Index (SI) were less significant (p<0.05).

CONCLUSION

Stress of any form augments the activity of sympathetic limb of autonomic nervous system. Cold stress produces intense stimulation of sympathetic nervous system with almost complete withdrawal of parasympathetic activity. Increased sympathetic vasoconstrictor discharge produces arteriolar constriction resulting in increased systemic peripheral resistance. This effect is mediated via norepinephrine secreted by postganglionic neurons of sympathetic nervous system. In addition, increased activity of sympathetic nerves increases heart rate and stroke volume. Impulses reaching the medulla also affect the heart rate via vagal discharge to the heart. The neurons from which the vagal fibers arise are in the dorsal motor nucleus of the vagus and the nucleus ambiguous. By the action of cold stress, parasympathetic activity is abolished and heart rate increases to unopposed increased sympathetic activity. Stroke volume is also increased significantly due to increased myocardial contractility. Increased heart rate and increased stroke volume significantly increase the cardiac output.

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Conflict of Interest: Nil

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Ethical Clearance: Procedures followed in the present study were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed concent was obtained from the subjects.

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Effect of Exercise on Heart Rate Variability (HRV) in Young Medical Students

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ABSTRACT

Objective: To study the effect of exercise on heart rate variability in young medical students and to compare pre and post exercise findings.

Method: This study was done in clinical laboratory of Physiology department. The pulse rate by 3 finger method, arterial Blood pressure by sphygmomanometer and Heart Rate Variability (HRV) with Annuphotorheograph was measured before exercise and after exercise. Harvard step test was used as exercise method. HRV data was analyzed to get HRV graph and FFT (Fast Fourier transform) power spectrum. The results were statistically analyzed by applying paired "t" test.

Results: In our study, the data analysis showed that after exercise, the pulse rate and the systolic blood pressure were significantly increased and the diastolic blood pressure was significantly decreased. The HRV and its frequency components in all frequencies were decreased significantly in both groups after exercise.

Conclusion: Our observation of pulse rate, arterial blood pressure and HRV, before and after exercise suggests that autonomic modulation of heart rate during exercise is associated with withdrawal of parasympathetic activity in both males and females.

Keywords: *Heart Rate, Blood Pressure, Exercise, Heart Rate Variability, Sympathetic System, Parasympathetic System*

INTRODUCTION

Movement and Physical activity are basic function of human body. But because of advances in modern technology physical activity or exercise no longer has been a natural part of our existence. The available scientific evidence shows that physical inactivity and sedentary life style have become a serious threat to our health and significantly increased the deterioration rate of the human body. As a result, the incidence of chronic diseases like hypertension, diabetes mellitus, atherosclerosis, coronary diseases have increased in last two- three decades, so it is important to include exercise in daily routine to maintain a good health[1].

In healthy human body, at rest, countless events occur simultaneously, in perfect coordination, allowing complex function to continue without conscious effort. The transition from rest to exercise is accompanied by substantial changes in a number of bodily functions, allowing the body to successfully adapt to additional stress.

When exercise signals the cardiopulmonary system to increase its output, a complex set of events influence the heart to increase the pumping of blood. The most important is the heart rate.

The heart rate is the result of a number of physical and emotional influences that are mediated through

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the autonomic nervous system. Both the vagal and the sympathetic nerves are constantly stimulating the sinoauricular node so that if the influence of either is increased or decreased, a change in rate will be manifested. A number of complex inhibitory as well as stimulating reflexes in the vascular system affect the heart rate.

Physical exercise is associated with parasympathetic withdrawal and increased sympathetic activity resulting in heart rate increase. Analysis of heart rate variability (HRV) can provide useful information about autonomic control of the cardiovascular system[2].

Beat- to- beat fluctuations of R-R interval is known as heart rate variability (HRV). Measurement of heart rate variability (HRV) has become a widely used tool for assessing the autonomic input to the heart under various physiological and pathological conditions. The spectral analysis of HRV is useful technique for quantifying over all HRV as well as specific components of HRV associated with respiration, sympathetic nervous system and other physiological variation [3, 4].

HRV is also used to study many pathological conditions. HRV is strong predictor of arrhythmic mortality following acute myocardial infarction. [3, 5, 6]. Decreased HRV is associated with coronary arthrosclerosis [7], coronary artery disease [5], and congestive cardiac failure [8]. HRV is also a useful tool in detection of early diabetic autonomic neuropathy [3, 8].

Arai Y. et al [9] studied the cardiac modulation during and immediately after exercise by HRV power spectral analysis and showed that there is marked reduction in heart rate spectral power at all frequencies as exercise progresses and followed by an increase during early recovery in normal subject and also showed that from rest to peak exercise the vagal activity dramatically decreases with exercise and completely withdrawn by peak exercise.

Study by Mikko Tulppo et al [10] demonstrated that physical fitness which is related to vagal modulation of heart rate during exercise is independent of aging. This provides evidence that good physical fitness has beneficial effect on cardio vascular autonomic function.

Exercise is body's most common physiological stressor hence can be consider as most practical test for cardiac function [11]. Present study was under taken to study the effect of exercise on the heart rate variability in young medical students. Harvard step test was used as exercise modality.

MATERIAL AND METHOD

Site of the study: The study was done in clinical laboratory of Department of Physiology.

Subjects: This study was done in 54 healthy young, medical students in the age group of 17 – 25 years. A brief history and general physical examination of all the students was done with main emphasis on respiratory diseases and cardiovascular diseases and on any medication. All subjects were explained about the procedure and their informed consent was taken. This study has been approved by Institutional Ethical Committee.

Study protocol: All the tests were carried out between 1 - 4 pm. The height and weight of the subject was measured with a scale fixed on the wall and weighing machine.

The subject was asked to lie-down on the couch in supine position and asked to relax and close his eyes. The probe of Pulse Oxymeter was clipped to the subjects left index finger, care was taken that subject did not move his hand. The probe was connected to the Annuphotorheograph which was in turn connected to personal computer with application software (Variability Analyzer 2008).

The pre exercise pulse was measured with three finger palpatory method. The cuff of sphygmomanometer was tied around right arm of the subject and blood pressure was measured by auscultatory method.

After the record, the subject was asked to get up and do the Harvard step test. Male subject steps up and down 20 inch bench 30 times per minute for 5 min or till exhausted. Female subject steps up and down 18 inch bench 30 times per minute for 4 min or till exhausted. The steeping rate was fixed with the help of a metronome. At the end of the task the subject was asked to lie down.

Post exercise pulse rate, blood pressure, HRV raw data were recorded immediately after exercise.

The recorded HRV raw data was analyzed to get

HRV graph and FFT power spectrum. For computing HRV indices, the recommendation of Task Force was followed [3] . Very Low Frequency (VLF), Low Frequency (LF), High Frequency (HF) spectral powers were determined by integrating power spectrum between 0.00-0.04Hz, 0.04-.15Hz, and 0.04-0.5 Hz respectively and expressed in normalized units. Total Power was calculated between 0.00-0.5Hz and expressed in absolute unit of millisecond squared.

Statistical analysis: The collected data was statistically analyzed. The paired "t" test was used to compare the pair of parameters pulse rate, blood pressure and heart rate variability components before exercise and after exercise. The 'P' value less than .05 was taken as significant.

RESULTS

Fifty four young adult medical students participated in this study. Out of 54, 27 were males and 27 were females. The data was expressed as Mean ± Standard deviation (SD).

The physical characteristics of the subjects' were shown in table 1.

Table 1: Physical Characters of Subjects of both Sexes

Variable	Male (n=27) Mean ± S.D	Female (n=27) Mean ±S.D
Age (years)	18.7 ± 1.23	18.3±0.68
Height (feet)	5.68 ± .27	5.11 ± .39
Weight (kg)	63.79 ± 9.17	50.75 ± 7.16

The table -2 shows pulse rate and blood pressure before and after exercise in males. There was a significant rise in the pulse rate and systolic blood pressure after exercise. There was significant fall in diastolic blood pressure after exercise.

Table-2: **Pulse rate, Systolic blood pressure (SBP), Diastolic blood pressure (DBP) in male subjects before and after Exercise.**

Variable	**Before Mean ± S.D**	**After Mean ± S.D**	**t-value**	**P-value**
Pulse rate (Beats per minute)	76.1481±8.5382	138.5926±10.4780	-24.387*	0.000*
SBP (mmHg)	121.4074±13.1712	163.1852±21.5568	-14.174*	0.000*
DBP (mmHg)	76.1481±7.5636	63.7778±6.0085	8.685*	0.000*

* Statistically Significant at 5% level i.e., P-value < 0.05.

The table -3 shows, the Heart Rate Variability components before and after exercise in males. There was decrease in mean R-R interval, Total Power (TP) , Very Low Frequency (VLF), Low Frequency (LF), High Frequency (HF) significantly

Table-3: Heart Rate Variability frequency components in male subjects before and after Exercise.

Variable	**Before Mean ± S.D**	**After Mean ± S.D**	**t-value**	**P-value**
Mean R-R Interval (msec)	.7722±9.967E-02	.5130±4.689E-02	15.645*	0.000*
TP ($msec^2$)	1751.4444±1558.0731	312.6481±184.2929	4.665*	0.000*
VLF (nu)	19.3542±11.9480	11.1797±8.2532	3.253*	0.003*
LF (nu)	21.6146±10.0487	5.0929±5.9679	7.739*	0.000*
HF (nu)	28.6006±15.6212	4.8015±4.8138	7.806*	0.000*

* Statistically Significant at 5% level i.e., P-value < 0.05.

The table -4 shows pulse rate and blood pressure before and after exercise in females. There was a significant rise in the pulse rate and systolic blood pressure after exercise. There was significant fall in diastolic blood pressure after exercise.

Table-4: **Pulse rate, Systolic blood pressure (SBP), Diastolic blood pressure (DBP) in female subjects before and after Exercise.**

Variables	Before Mean ± S.D	After Mean ± S.D	t-value	P-value
Pulse rate (Beats per minute)	72.4444±7.2182	123.2593+9.1172	-39.159*	0.000*
SBP (mmHg)	109.1852±10.3219	142.9630±11.3323	-16.953*	0.000*
DBP (mmHg)	70.6667±7.3170	62.5926±6.5590	5.630*	0.000*

* Statistically Significant at 5% level i.e., P-value < 0.05.

Table 5 - Shows, the Heart Rate Variability components before and after exercise in females. There was decrease in mean R-R interval, Total Power (TP) , Very Low Frequency (VLF), Low Frequency (LF), High Frequency (HF) significantly.

Variable	Before Mean ± S.D	After Mean ± S.D	t-value	P-value
Mean R-R Interval (msec)	.7689±9.283E-02	.5356±5.094E-02	14.941*	0.000*
TP ($msec^2$)	2021.6815±1689.7118	601.2111±580.3850	5.381*	0.000*
VLF (nu)	12.3797±6.9892	6.8504±4.7616	3.465*	0.002*
LF (nu)	18.9555±10.2276	7.3387±8.1513	5.129*	0.000*
HF (nu)	39.2280±13.1299	12.1585±13.9631	9.317*	0.000*

Table-5: Heart Rate Variability frequency components in female subjects before and after Exercise.

* Statistically Significant at 5% level i.e., P-value < 0.05.

DISCUSSION

The study was conducted in 54 medical students. Out of 54, 27 were male students and 27 were female students. All of them were normotensive and free from any cardiovascular disorders, respiratory disorders and not on any medication.

The pulse rate, arterial blood pressure, Heart Rate Variability (HRV) was measured before exercise and after exercise. Harvard step test was used as exercise method.

Pulse rate and Arterial blood pressure Response:

The pulse rate showed significant rise after exercise in males as well as in females. The systolic blood pressure after exercise was significantly increased in both the groups. The diastolic blood pressure was significantly decreased after exercise in both the groups. (Table-2 and 4)

The results were similar to study done by Stephen N. et al. [12]. Their results showed that heart rate increased similarly in males and females

after exercise. Systolic blood pressure increased significantly. But contrast to our results, they got increase in diastolic blood pressure.

The study by Arai et al. [9] also showed increase in systolic blood pressure. The increase in the arterial blood pressure during exercise results from multiple stimulatory effects including vasoconstriction of arterioles and small arteries in most tissues of the body due to strong sympathetic vasoconstrictor discharge, increased pumping activity of the heart and a great increase in the mean systemic filling pressure caused by venous contraction[13].

In exercise involving isotonic muscular contraction, there is net fall in the total peripheral resistance due to vasodilatation in exercising muscles. Consequently the diastolic blood pressure remains unchanged or falls [14].

HEART RATE VARIABILITY (HRV) RESPONSE

The HRV data was analyzed and presented in FFT power spectrum components. The Mean R-R interval was expressed in mm seconds. Total Power was calculated between 0.00-0.5Hz and expressed in absolute unit of millisecond squared. Very Low Frequency (VLF), Low Frequency (LF), High Frequency (HF) spectral powers were determined by integrating power spectrum between 0.00-0.04Hz, 0.04-.15Hz, and 0.04-0.5 Hz respectively and expressed in normalized units. After exercise, the HRV and its frequency components in all frequencies were decreased significantly (Table-3 and5).

Our results were similar to the study done by Arai et al, [9] and also Yamamoto[15]. Their study results showed that there was marked reduction in HRV spectral power at all frequencies as exercise progressed followed by increase during early recovery period but were significantly below pre exercise value.

The sympathetic and parasympathetic nervous systems are primary mediators of heart rate modulation during exercise.

The studies of HRV, with combination of various pharmacological and physiological manipulations showed that HF component of HRV power spectrum was associated with cardiac parasympathetic activity, LF component of power spectrum might be associated with both cardiac sympathetic and parasympathetic activity also with resistant vessel reactivity [15, 9, 16,] VLF component of power spectrum might be associated with thermoregulation and rennin-angiotensin-aldosterone system [15, 17, 18].

Even though, the HF component of power spectrum was considered as index of cardiac vagal activity or index of cardiac parasympathetic tone by most of the researchers, the controversy exists for the association of LF and VLF components [10, 8].

From rest to exercise, the reduction in the HF spectral power indicates that modulation of vagal activity dramatically decreases with exercise. With increasing work load, vagal activity was reduced in early exercise and completely withdrawn by peak exercise [9, 19].

At low- to - moderate intensities of exercise, increase in heart rate was primarily mediated by parasympathetic withdrawal and the sympathetic activity starts to increase approximately at 60% of VO2 Max. [15].

A study by J. Andrew Taylor [17] showed that parasympathetic nervous system was prepotent in the generation of all R-R interval oscillation including VLF, LF, and HF.

The decrease in parasympathetic activity following exercise might be a possible explanation for our observation that all frequency components of HRV power spectrum were decreased after exercise.

Our observation of pulse rate, arterial blood pressure and HRV, before and after exercise suggests that autonomic modulation of heart rate during exercise is associated with withdrawal of parasympathetic activity.

CONCLUSION

The study was done in 54 young medical students. Harvard step test was used as exercise modality.

The pulse rate, systolic blood pressure, diastolic blood pressure and heart rate variability were recorded before and after Harvard step test.

After exercise, pulse rate and systolic blood pressure were significantly increased in both the groups. The diastolic blood pressure was significantly decreased, after exercise in both the groups.

The heart rate variability was significantly decreased after exercise. Its frequency components VLF, LF, HF also decreased significantly after exercise in both groups.

During exercise, there is withdrawal of parasympathetic activity to the heart resulting in increased heart rate.

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Thyroidectomy and Thyroxine Replacement Caused Impaired Oral Glucose Tolerance in Rat

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ABSTRACT

Thyroxine influences diverse metabolic pathways important in glucose metabolism and important mediators of glucose homeostasis. Thyroxine replacement therapy is usually given in cases of hypothyroidism thus this study was conducted to assess the effects of thyroxine replacement therapy and thyroidectomy on glucose tolerance. Forty rats were divided into four groups (n=10). Group 1(control) was sham operated, group 2 was thyroidectomised, group3 was sham operated and treated with 10mcg/100g bdwt for five weeks, Group 4was thyroidectomised and given 10mcg/100g bdwt T4 for five weeks. The rats were anaesthetized by injecting 0.2ml/100g/bdwt ketamine hydrochloride intraperitonially. The rats were weighed before and weekly after the surgery. Oral glucose tolerance test was performed on the rats after five weeks treatment period and total serum thyroxine was determined by chemi-immunoluminiscence. Results were presented as mean +SEM and P values less than or equal to 0.05 was taken as significant. There was fluctuating weight loss and gain in groups 3 and 4 while group 2 had significant steady weight gain compared with control. Fasting blood sugar at zero minute was significantly higher at groups 2, 3 and 4. At 30 mins, glucose level was significantly reduced in groups 2 and 3while group 4 was not significantly different from control. At 60 and 90 minutes, glucose level was markedly reduced in the three groups compared with control but at 120 min there was significant difference between glucose level in the groups and control. Based on the results in this study, hypothyroidism and hyperthyroidism cause impairment in glucose tolerance and an elevated fasting blood glucose level while thyroxine replacement did not normalise the disturbances caused by thyroidectomy on glucose tolerance nor did it reduce the fasting blood sugar level as observed when compared to the control.

Keywords: *thyroidectomy, thyroxine, oral glucose tolerance*

INTRODUCTION

Thyroxine influences diverse metabolic pathways important in glucose metabolism and important mediators of glucose homeostasis (1). For nearly a century, many publications focused on the relationship between diabetes and thyroid disease (2). Essentially all aspects of metabolism are enhanced under the influence of thyroid hormone. Toshiki et al (3) reported abnormal glucose tolerance in hyperthyroidism however glucose tolerance in hypothyroidism has not been reported. Hypothyroidism sometimes resulting from thyroidectomy has become an increasing trend in recent years. Thyroxine is taken to replace the deficiency which exists in hypothyroidism and therefore to probably completely restore normal metabolic activity. However thyroxine is a diabetogenic hormone. This study was conducted to evaluate the effect of exogenous thyroxine on glucose tolerance inother to understand how well thyroxine replacement therapy can compensate for the removal of the thyroid gland in relation to its role in glucose metabolism and to evaluate the relationship between exogenous thyroxine administration and body weight in the management of hypothyroidism.

METHOD

40 rats of the Wister strain were bred at the central animal house, university of Ibadan, they were allowed to acclimatize for two weeks and then they were divided into four groups of ten rats each. Group 1 (control) was sham operated; Group 2 was thyroidectomised; Group 3 was sham operated and

given 10mcg/100g body weight Thyroxine (T4) for five weeks. Group 4 was thyroidectomised and given 10mcg/100g body weight T4 for five weeks.

METHOD OF THYROIDECTOMY

The rats were anesthesized with 0.2ml/100g body weight ketamine hydrochloride injection intraperitoneally. After which an incision was made in the neck. The thyroid glands were then extirpated and the incision sutured for the thyroidectomised rats while the incision was closed with the thyroid intact in the sham operated rats.

THYROXINE ADMINISTRATION

One week after surgery groups 3 and 4 rats were given L-thyroxine daily before meals at a dose of 10mcg of L-thyroxine per 100g of their body weight for five weeks as a modification of the method of Mokuno et al (4). Thyroxine was diluted in distilled water at a concentration of 10mcg per 0.5ml of distilled water and was orally administered with the aid of an oral cannula for thirtyfive days. Groups 1 and 2 rats were given distilled water only.

BODY WEIGHTS

The body weights of the rats in all the groups were measured before surgery and on a weekly basis after with the aid of an electronic weighing scale.

ORAL GLUCOSE TOLERANCE TEST

The rats were fasted overnight but had access to water. Blood sugar was determined from a drop of blood from the tail vein using the Accu-check glucometer and strip. Each rat was then orally administered 0.175g of glucose D per 100g of body weight dissolved in distilled water at a concentration of 8.75g of glucose per 25mls of water. The blood sugar level was again determined after 30, 60, 90 and 120 minutes of oral ingestion of glucose.

THYROXINE ASSAY

The rats were sacrificed by cervical dislocation and blood was collected via cardiac puncture. The blood was allowed to cloth and centrifuged for 30 minutes at a speed of 3,000 rpm. The supernatant (serum) was then collected into another bottle with the use of a mircropippete and frozen until the hormonal assay was done. The levels of total serum thyroxine for each rat was determined by chemi-immunoluminiscence with the aid of the authomated immunodiagnostic ECiQ and the thyroxine reagent kit products of Ortho-Clinical Diagnostics, a Johnson-Johnson Company, UK. Using the methods outlined by the kit manufacturer, a calibration curve was generated. (5).

STATISTICAL ANALYSIS

Results are presented as mean ± *SEM* and data analysed using student t test. $P < 0.05$ was taken as significant

RESULTS

Table 1: Mean serum thyroxine levels in the rats after the five weeks period of thyroxine administration

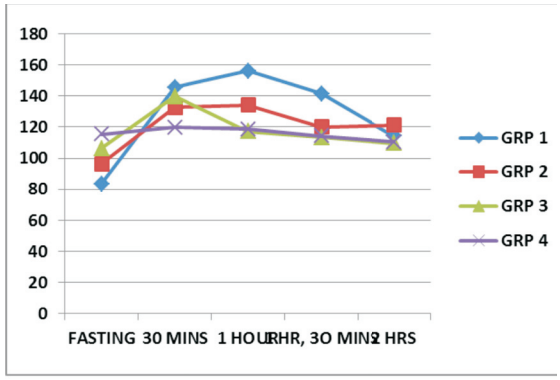
GROUP1 (CONTROL)	GROUP 2 (Hypothyroid)	GROUP 3 (Hyperthyroid)	GROUP 4 (thyroxine replacement)
30.4 ± 1.2 nmol/l	**17.4 ± 1.7***** nmol/l	**49 ± 4.7**** nmol/l	**27.14 ± 1.2*** nmol/l

*significantly different from control group with P<0.5

The thyroxine replacement group had a mean thyroxine level slightly lower than that of the control (P<0.05) but markedly greater than that of the hypothyroid group (P<0.001) and lower than that of the hyperthyroid group (P<0.01) (Table 1).

Figure 1: Effect of thyroxine on oral glucose tolerance test.

A plot of concentration of glucose in mg/dl against time

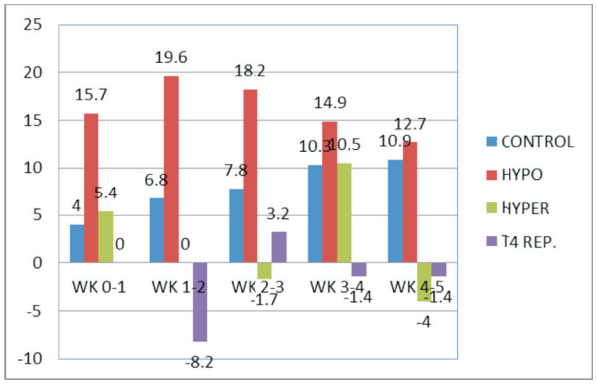


The mean blood fasting sugars of groups 2, 3 and 4 when compared to the control group was significantly higher. The mean blood glucose after 30 mins of oral glucose ingestion of groups 2 and 4 was significantly lower than control but the mean glucose level of group 3 was not significantly different from the control

group. After one hour of oral glucose ingestion, the mean blood glucose levels of the groups 2, 3 and 4 was significantly lower than control group, the same was observed after 1hr, 30 minutes of oral glucose ingestion. After 2 hours of oral glucose ingestion, there was no significant difference in the mean glucose levels of groups 2, 3 and 4 when compared with the control group. The mean fasting blood sugar of group 2 was significantly lower than that of group 4, the mean blood sugars 30 mins after oral ingestion of glucose were not significantly different, but 1 hour after the ingestion of glucose, the mean glucose level of group 2 was significantly higher than group 4. There was no significant difference across the groups in the mean glucose levels 1hr, 30 mins and 2 hrs after oral ingestion of glucose (Fig 1).

Thyroxine replacement and hyperthyroid groups in figure 2 shows fluctuations in weight. There was an initial rapid loss in weight in the thyroxine replacement group followed by brief weight gain in the third week and weight loss in the fourth and fifth week.

Figure 2: Changes in weight observed in thyroxine treated and thyroidectomised rats.



DISCUSSION

The elevated serum thyroxine in group 3confirmed hyperthyroidism and in the thyroxine replacement group, hypothyroidism was overcome significantly. Hexokinase promotes glucose phosphorylation in the liver and other body tissues which serves to capture the glucose in the cell. The elevated fasting blood glucose of the hypothyroid rats could be attributed to lower activities of hexokinase as was observed by Walter and Mclean (6) in hypothyroid rats. Hyperthyroidism results in altered glucose metabolism (7), therefore in hyperthyroid humans as well as in experimental thyrotoxicosis in animals, glucose turnover and hepatic glucose production are increased due to increased metabolic rate and peripheral glucose utilization (8). This was reported by Dimitriadis et al (9) who observed that experimental and spontaneous hyperthyroidism in humans caused increased glucose production and impaired suppression of glucose production by insulin. It is not well understood why thyroxine therapy administered to thyroidectomised rats did not normalize the fasting blood glucose level although Walter and Mclean observed that the level of hexokinase approached control values after administration of thyroxine to thyroidectomised rats.

The marked rise in blood glucose level in the hyperthyroid and control rats after 30 minutes of oral ingestion of glucose may be due to impaired glucose tolerance that resulted from glucose loading; a phenomenon termed oxyhyperglycaemia (4). Overweight hyperthyroid women lose their first-phase response to hyperglycemia (7). The subdued oxyhyperglycaemia observed in the hypothyroid rats is in line with the findings of Mokuno et al (4). Thyroxine replacement further reduced the effect of glucose loading on thyroidectomised rats.

The effect of glucose loading on the blood glucose level wears out as was seen in all the groups. In the hypothyroid rats, the blood glucose falls minimally over the 120 minute period and did not return to the fasting blood glucose level within this period; this is in line with the findings of Sudipta et al (10) in which blood glucose level remained elevated even after 24 hours after glucose loading. This may also be due to decreased activities of hexokinase observed by Walter and Mclean (6) in hypothyroid rats.There is conflicting reports regarding the glucose tolerance of hyperthyroid rats. According to Roubsanthisuk et al (11), in hyperthyroid patients, thyroid hormone levels are inversely related to the rate of insulin release, suggesting a relationship between altered insulin secretion and severity of hyperthyroidism. Oghuni et al (7) also stated that insulin sensitivity is altered in hyperthyroid patients. The pattern observed in the hyperthyroid rats in which the blood glucose started to fall after 60 minutes of glucose loading and returned to the normal level after 120 minutes although in conflict with the above stated observations is in line with the findings of Mokuno et al (4) and this could be as a result of increased insulin secretion to compensate hyperglycaemia after glucose load that was observed in hyperthyroid patients less than 30 years old by Komiya et al (12). The fall in blood glucose was also observed in the rats treated with thyroxine in which the blood glucose level returned to normal 90 minutes after oral glucose loading.

Thyroidectomy which led to hypothyroidism caused weight gain, an effect which was reversed by thyroxine therapy. On the other hand, hyperthyroidism led to weight loss.The weight gain in the hypothyroid rats is in line with the findings of Sudipta et al (10) who reported that hypothyroidism is generally associated with some weight gain because of low Basal Metabolic Rate (BMR). It is well known that hyperthyroidism caused extensive weight loss despite normal or increased caloric intake (13). This was observed in the hyperthyroid rats. Weight loss reflects not only a depletion of body adipose tissue stores but also a loss of muscle mass caused by accelerated catabolism and heat elimination (13). The rats that were administered thyroxine showed no net gain in weight, this could be attributed to the effect of thyroxine administration in reversing the low metabolic rate that resulted in weight gain observed in hypothyroid rats.

Based on these results it can be concluded that hypothyroidism and hyperthyroidism may cause disturbances in glucose tolerance and an elevated fasting blood glucose level. Thyroxine replacement therapy used in thyroidectomy did not normalise the disturbances caused by hypothyroidism on glucose tolerance neither did it reduce the fasting blood sugar level although it inhibited hyperglycaemia in a non-synchronous manner as compared to the pattern of glucose tolerance curves in the hypothyroid rats.

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Ethical Clearance: Ethical clearance was taken from University of Ibadan Institutional animal care and use committee.

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Conflict of Interest - Nil

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Long Latency Reflex (LLR) of Abductor Digiti Minimi (ADM) in the Dominant and non Dominant Hand of Healthy Adult Males

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ABSTRACT

The LONG LATENCY REFLEX is an electrical response following the H reflex on stimulation of a mixed nerve. It assesses the sensory and motor pathways travelling via cortex. It helps to determine the conduction velocity within the spinal cord. LLR is clinically useful in investigating movement disorders like Parkinson's disease, Huntington's chorea. As very few Indian studies are available on LLR, the present study was undertaken to determine latency and amplitude of LLR of abductor digiti minimi of the dominant and non-dominant hand. Twenty healthy male subjects in the age group of 25-35 years were studied by stimulating ulnar nerve while the subject was maintaining 10-20% of maximum voluntary contraction of the abductor digiti minimi. A stimulus intensity of 5-10mA (submaximal) of 1 ms duration, delivered from a constant current stimulator through bipolar stimulating electrodes was used to stimulate the muscle. The latency of the first deflection from the baseline and the peak to peak amplitude of the evoked LLR responses were measured digitally using a digitalized nerve conduction / EMG / EP machine (Aleron, Recorders Medicare systems, Chandigarh, India) .

Statistical analysis showed that the LLR latency of ADM of dominant hand (48.7±5.7ms, Mean± SD) was equal to the corresponding value obtained from the non-dominant hand (47.1±4.7ms). LLR amplitude of ADM of dominant hand (155.3±78μV,Mean ± SD) was also equal to the corresponding value from the non-dominant hand(144.7±49.9 μV). The height of the individual and LLR latency showed a significant positive correlation in the dominant hand ($p< 0.02$) and also in non-dominant hand ($p<0.05$).

Keywords: *Long latency reflex (LLR), H reflex.*

INTRODUCTION

A nerve conduction study is a commonly used medical diagnostic test to evaluate the function of the motor and sensory nerves in the human body. Nerve conduction studies are used to diagnose some of the common disorders like peripheral neuropathy, Guillain Barre Syndrome.

They can be used to localize the site or level of lesion and it can also determine if the pathology involves the neuromuscular junction, nerve root, anterior horn cells or the peripheral nerves. Nerve conduction studies help to differentiate between preganglionic and post ganglionic disorders. It helps in identifying the pathophysiology, and in distinguishing axonal loss from demyelinating disorders. It provides information about the prognosis of the disease and helps in deciding the line of management. Nerve conduction studies include motor nerve conduction tests, sensory nerve conduction tests and testing of the F response and H reflex .

Long Latency Reflex is the electrical response following the H reflex, when a mixed nerve is stimulated. It assesses the sensory and motor pathways travelling via cortex. . On electrical stimulation of the mixed nerve the sensory afferents travel in posterior columns, relay in motor cortex and efferents travel in the pyramidal tract, to end on motor neurons It helps to determine the conduction velocity within the spinal cord.[1-3] LLR is clinically useful in investigating movement disorders like Parkinson's

disease, Huntington's chorea.[5] Increased LLR is found predominantly in patients with resting and postural tremors. The present study was undertaken as very few Indian studies are available on LLR.[4]

MATERIAL AND METHOD

The Study was conducted in the department of Physiology, PIMS Pondicherry. Ethical clearance was obtained from the Institutional Ethical Committee. An informed written consent was obtained from the participants before including them in the study.

This Observational and Cross sectional study was carried out on twenty healthy clinically normal male subjects in the age group of 25 to 35 years in and around PIMS with no known cardiovascular and neuromuscular diseases.

Persons with diabetes mellitus, Neuromuscular injury / disorders, Impaired nerve conduction / myopathy, Smokers and alcoholic, Subjects on medications which might alter nerve conduction, Subjects with present or past history of fracture of upper limb bones, Subjects with implanted pacemaker were excluded from the study.

The subjects chosen for the study had undergone a complete clinical neurological examination at the neurology department at PIMS. Subjects then reported to the electrophysiology laboratory at 10 AM in the morning after a light breakfast. The entire experimental procedure was explained to them and an informed written consent was obtained from them prior to the study. Subject's arm length, height, oral temperature and body weight were recorded. The dominant hand of the subject was identified by asking the subject about the hand used to write, draw, eat etc.

The Subjects were tested at the same time each day in the electrophysiology lab with reduced sound and light at 22°C. The subject was asked to rest comfortably in the supine position. The skin over the dorsum of the forearm and palm was thoroughly cleaned with spirit to decrease impedance.

The electrodes were fixed as follows: The Active recording electrode is a Silver – silver chloride surface electrode was fixed at the midpoint of ADM muscle belly. The reference recording electrode is a Silver – silver chloride surface electrode. It was fixed on the volar surface of the little finger. The Stimulating Bipolar metal electrodes were used to stimulate ulnar nerve near the wrist 8 cm proximal to the active recording electrode with cathode placed proximal. The Ground electrode was fixed at the wrist between the active electrode and the stimulating electrode. The subject's arm was placed in an extended position with support and the subject was asked to maintain 10-20% of maximum voluntary contraction of the abductor digiti minimi by abducting the little finger against resistance.

The stimulus intensity was 5-10mA (submaximal) of 1 ms duration, delivered from a constant current stimulator through bipolar stimulating electrodes.Stimulus repetition rate was 51 Hz. The Long latency reflex was recorded using digitalized nerve conduction / EMG / EP machine (Aleron, Recorders Medicare systems, Chandigarh, India).

200 responses were averaged and the LLR response was recorded.

The latency of the first deflection from the baseline and the peak to peak amplitude of the evoked LLR responses were measured digitally.

RESULTS

The results are given below as Mean +/- SD (table 1 and 2)

Table 1: LLR Latency

	Dominant hand	Non dominant hand
Mean (ms)	48.7	47.1
SD	5.7	4.7

Table 2: LLR Amplitude

	Dominant hand	Non dominant hand
Mean (μV)	155.3	144.72
SD	78.0	49.9

DISCUSSION

From this study, it was shown that LLR was elicitable from the Abductor Digiti Minimi in all subjects by ulnar nerve stimulation when the muscle was put under contraction. The mean latency in the dominant hand (right) was 48.7±5.7ms, (Mean± SD)

and the mean latency in the non-dominant hand (left) was 47.1±4.7ms. The mean amplitude in the dominant hand (right) was 155.3±78μV (Mean± SD) and the mean amplitude in the non-dominant hand (left) was 144.7±49.9 μV.In our study the side –side differences in the mean latencies and the amplitude were not statistically significant. The height of the individual and LLR latency showed a significant positive correlation with the dominant hand ($p< 0.02$) and also with non-dominant hand ($p<0.05$).

CONCLUSION

Long latency reflex of Abductor digiti minimi was recorded in all the subjects. The values of LLR latency and amplitude contribute towards the normal data which can be used to diagnose neurological disorders.

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Reflection of Early Vestibular Stimulation in Sensorimotor Integration: a Study

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ABSTRACT

The early vestibular stimulation plays vital role in development of sensorimotor integration. The present study was intended to evaluate the efficacy of practice of using cradle in the early infancy for the development of the sensorimotor integration. The study was cross-sectional case-control study involving 62 kids studying at kindergarten in a preschool. The children who had early vestibular stimulation acted as cases (n =28) and those who has not been given early vestibular stimulation acted as control. (n = 34). Flexibility, power testing, balancing were checked among these. The scores of individual test were noted down and they were added up to make Sensorimotor Integration (SMI) Score of each kid. When compared between these scores it was found that it was significantly better in experimental group. Balance beam test and Draw man test revealed significant differences in the control and cases, balance and body perception was better in experimental group. We can conclude from the scores that on developmental scale the children with early vestibular stimulation were placed at higher rank as compared to control. We found that kids with early vestibular stimulation showed more interest and performance in the sports involving motor skills, balance activity. The children exposed to early vestibular stimulation might perform better in the sports in the adulthood.

Keywords: *cradle, vestibular stimulation, sensorimotor integration,*

INTRODUCTION

Its a common practice in Indian families to use cloth cradle or rocking chair for children in early few months of life. This early vestibular stimulation plays vital role in development of sensorimotor integration[1]. There are different schools of thought for use and effect of cradle amongst, psychiatrist, pediatrician[2] and therapist,

In the development of child eye and neck muscle responses are among the infants first sensorimotor functions and they lay down the groundwork for the sensorimotor development in the rest of the body. Even in the adults much of the sensorimotor system works on coordinated manner with eyes and neck. In a perfectly developed sensorimotor system the inputs in the form of senses will give the output in the form of "End product" only after integration of the senses, viz. auditory, vestibular, proprioceptive, tactile and visual sensations. Motor behaviours are in some way related to the faulty modulation of sensory input [3]. As the law states that if input is altered the end product might vary in terms of quality. Vestibular input is differentially regulated depending on the locomotion speed and pattern used[4]. The present study was undertaken to evaluate the effect of alternation in one of the input to i.e. vestibular stimulation on end product i.e. eye hand coordination, motor responses, motor planning, body percept etc.

Different kinds of vestibular stimulation have

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different effects on different people at different times in their lives. Some vestibular stimulation can soothe babies, and if they're calm and not crying they can pay more attention to other sensory stimulation and learn from it.

AIMS AND OBJECTIVES

The study was intended to evaluate the efficacy of practice of using cradle in the early infancy for the development of the sensorimotor integration. Evaluating and comparing the sensorimotor integration and overall development of the kids who has been given and not given vestibular stimulation in early infancy.

MATERIALS AND METHOD

The present study was carried out at Department of Physiology, Hi- Tech Medical College, and Bhubaneswar. The study was cross-sectional case-control study involving 62 kids studying at kindergarten in a preschool. The kids attending the preschool were evaluated for flexibility, endurance, muscle power, balance agility, eye-hand coordination, body percept (draw a man test) [5]. The children who had early vestibular stimulation acted as cases (n =28) and those who has not been given early vestibular stimulation acted as control. (n = 34). The validated questionnaire was given to mothers for revealing the fact about antenatal history, birth history, and significant diseases in early infancy and childhood. The emphasis was given on the fact that whether the kid has been given early vestibular stimulation in the early four- six months of life or not. Those children having history of convulsions, jaundice were excluded from study.

Flexibility was tested for lower limb by hamstring test. In this test kid was asked to lie down in supine position then his leg was raised similar to Straight Leg Raising (SLR) test. For testing endurance the kid was asked to run in a lap of 15 feet, and number of rounds made by them was noted down. The power testing for upper limb was tested by asking a kid to throw a ball. The power testing for lower limb was tested by asking a kid to jump with two legs (i.e. broad jump. The ability of the child to maintain the balance was assessed by asking him to walk on a horizontal zigzag beam. In shuttle run three graded obstacles were kept each at three feet distance, for a distance of 10 feet.

For testing eye hand coordination kids were asked to arrange 10 blocks as tower making activity in 30 seconds.

Draw a man test indicates child's intelligence and his perception of body parts in his mind. Kids were given paper and pencil and asked to draw a man. The points were given as follows. Kids who have drawn face limbs and abdomen were given three points. Those who have drawn only face and limbs were given two points. Kids who have drawn face and facial part only were given one point. Kids who have scribbled were given zero point.

The scores of individual test were noted down and they were added up to make Sensorimotor Integration (SMI) Score of each kid. Mean Sensorimotor Integration (SMI) score of each group was calculated for control and cases separately. These scores were compared with each other by statistical analysis using Student's't' test.

RESULTS AND ANALYSIS

We studied 62 kids studying at junior kindergarten. These included 26 females and 36 males. On the basis of history given by the mother whether kid was given significant vestibular stimulation, they were divided into two groups. Those who has been given early vestibular stimulation as cases (n=28) and those who has not been given early vestibular stimulation (n=34). The mean age of the kids for control was 4.21 (SEM ± 0.86), and for that cases it was 4.16 (SEM ± 0.83). Every child's performance was noted on separate sheet of paper which also included remark of teacher. The same sheet was given to the kid for draw a man test.

Following results were observed.

FLEXIBILITY

This test gives knowledge about joint movement and their flexibility. When tested for upper limb in control group for sit and reach activity it was observed that 52.94% scored three points while 47.05% scored two points. When observed amongst the cases 85.7% scored three points and 14.3% scored two points. When evaluated for lower limb Hamstring test was performed it was observed that 58.82% scored three points 41.17% scored two points amongst the control group. While amongst the cases 21.42% scored three points and 78.5% scored two points. It was observed that flexibility of cases was better than control for

upper limb for upper limb but when differences were analysed, it was not statistically significant. In lower limb it was little bit less in cases. This might be due to sedentary lifestyle which involves more of sitting activity like TV watching, video games, other indoor games etc. This indicates more inclination of these kids towards sports like activity.

Table No 1 - Showing result of flexibility test for upper limb.

Test for upper limb	Control group				Experimental group			
Points	III	II	I	Zero	III	II	I	Zero
Sit and reach	52.94%	47.05%	NIL	NIL	85.7%	14.3%	NIL	NIL

Table No 2 - Showing result of flexibility test for lower limb.

Test for lower limb	Control group				Experimental group			
Points	III	II	I	Zero	III	II	I	Zero
Hamstring test	58.82%	41.17%	NIL	NIL	21.42.%	78.5%	NIL	NIL

ENDURANCE TEST

This test was done to evaluate cardio respiratory efficiency. It was observed that 47.05% scored three points, 35.29% scored two points, 17.64% scored one point amongst the control. In the experimental group 50% scored three points 42.82% scored two points and 7.1% scored one point. It was observed that endurance was more or less equal amongst cases and control and the difference was statistically not significant.

Table No 3 - Showing result of endurance test for cardiorespiratory efficiency.

Endurance test	Control group				Experimental group			
Points	III	II	I	Zero	III	II	I	Zero
Cardiorespiratory efficiency	47.05%	35.29%	17.64%	NIL	50%	42.85%	7.15%	NIL

POWER TESTING

Power testing for upper limb by ball throwing activity for control group showed that 47.05% scored three points 52.94% scored two points. When evaluated for the cases 85.71% scored three points and 14.28% scored two points. When tested for lower limb, amongst the control 64.75% scored three points. 29.41% scored two points and 5.88% scored one point. While in cases all 100% scored three points. It was observed that cases depicted higher values as compared to control in both lower and upper limb. When the differences were analysed it was observed that it was statistically significant ($P < 0.05$).

Table No 4 - Showing result of endurance test for power testing for upper limb.

Power testing for upper limb	Control group				Experimental group			
Points	III	II	I	Zero	III	II	I	Zero
Ball throwing activity	47.05%	52.94%	NIL	NIL	85.71%	14.28%	NIL	NIL

Table No 5 - Showing result of endurance test for power testing for upper limb.

Power testing for lower limb	Control group				Experimental group			
Points	III	II	I	Zero	III	II	I	Zero
Broad jump	64.75%	29.41%	5.88%	NIL	100%	NIL	NIL	NIL

BALANCE TEST

In shuttle run test for crossing the obstacle showed that amongst the control 11.64% scored three points 88.23% scored two points while amongst the cases 14.27% scored three points and 85.71% scored two points. the points scored were more or less similar in two groups, difference between score of two group was not statistically significant.

When tested for balance beam amongst the control 17.64% scored three points and 64.7% scored two points and 5.88% scored one point, and 11.64% scored zero point. When tested amongst the cases 57.14% scored three points and 35.71% scored two points and 7.14% scored one point. In balance beam test we observed more score amongst the cases and the difference was statistically significant ($P < 0.05$).

Table No 6- Showing result of Balance test for shuttle run.

Balance Test	Control group				Experimental group			
Points	III	II	I	Zero	III	II	I	Zero
Shuttle run	11.64%	88.23%	NIL	NIL	14.28%	85.71%	NIL	NIL

Table No 7- Showing result of Balance test for Balance Beam.

Balance Test	Control group				Experimental group			
Points	III	II	I	Zero	III	II	I	Zero
Balance beam test	17.64%	64.7%	5.88%	11.64%	57.14%	35.71%	7.14%	NIL

EYE HAND CO-ORDINATION TEST

Tower making activity amongst the control group 50% scored three points 42.85% scored two points and 7.14% scored one point While amongst cases. 58.82% scored three points, 35.29% scored two points and 5.88% scored one point. It was observed that the values amongst cases was little bit higher as compared to control but when analysed by students t test the difference was not statistically significant ($P > 0.05$).

Table No 8 - Showing result of eye hand coordination test.

Eye hand Co-ordination	Control group				Experimental group			
Points	III	II	I	Zero	III	II	I	Zero
Make a tower	50%	42.8%	7.14%	NIL	58.82%	35.29%	5.88%	NIL

DRAW A MAN TEST

In this test when tested for control group 11.76% scored two points and 88.23% scored zero point in control group. When evaluated amongst cases 64.28% scored three points, 35.71% scored two points. In our study scores were best in cases as compared to control also the differences were statistically significant (P <.0.05)

Table No 9 - Showing result of Draw A Man Test

Draw a man	Control group				Experimental group			
Points	III	II	I	Zero	III	II	I	Zero
Body perception	NIL	11.76%	NIL	88.23%	64.28%	35.71%	NIL	NIL

ANALYSIS

Table No 10- Showing average scores with standard error of mean in respective columns.

Group	Balance beam test	Draw a man test	SMI Score
Control	2.23 SEM ±0.65	0.35 SEM ±0.69	18.94 SEM ±2.83
Experimental	2.71 SEM ±0.59	2.5 SEM ±0.50	23.4 SEM ±2.02

Table No 11- Showing comparative analysis by unpaired Students t test with one tail distribution which revealed following facts.

SN	Analysis by Students t test for	t value	P value	Remark
1	Balance beam test	0.002	P < 0.05	Significant
2	Draw a man test	0.0026	P < 0.001	Highly significant
3	SMI Score	0.0016	P < 0.001	Highly significant

The scores of individual test were noted down and they were added up to make Sensorimotor Integration (SMI) Score of each kid. Mean Sensorimotor Integration (SMI) score of control group was 18.94(SEM ±2.83) and for cases 23.4 (SEM ±2.02). These scores were compared with each other by statistical analysis using unpaired Student's't' test one tail distribution. It was observed that SMI score was more in the cases as compared to control. The differences were statistically significant (t =0.0016, P < 0.05). The Students't' test indicates that there is more sensorimotor integration amongst cases than in control group. Similarly individual comparison between balance beam test and draw man test also depicted statistically significant differences between cases and control. When it was analysed by Students't' test, the difference was statistically significant (P < 0.05).

DISCUSSION

The vestibular system is one of the first sensory systems to reach a mature level in the course of early development. Lying in close proximity to the inner ear, inside the skull, the vestibular system consists of two parts. One of these responds to the pull of gravity and provides information about the position of the head relative to the horizontal plane of the earth's surface. The other one responds to movement of the head and gives a strong sensation of rotation in one direction or another. The early vestibular stimulation leads to better bilateral coordination which reflect in the better performance in the sports and balancing activities.[6]

CONCLUSION

Sensorimotor Integration Score in the group who has not been given significant early vestibular stimulation was 18.94 SEM ±2.83. Sensorimotor integration Score in the group who has been given early vestibular stimulation it was 23.4 SEM ±2.02. When compared between these scores it was found that it was significantly better in experimental

group. Balance beam test and Draw man test revealed significant differences in the control and cases, balance and body perception was better in experimental group. It is possible that this study might be pioneering study on this topic, with a base and knowledge of neurophysiology and the applications of rehabilitation medicine. We can conclude from the scores that on developmental scale the children with early vestibular stimulation were placed at higher rank as compared to control. We found that kids with early vestibular stimulation showed more interest and performance in the sports involving motor skills, balance activity. The children exposed to early vestibular stimulation might perform better in the sports in the adulthood.

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Ethical Clearance: Institutional ethical Committee.

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Role of Vitamin D in Obesity and Type II Diabetes Mellitus among Elderly Males

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ABSTRACT

Aims and Objective: The study was conducted to assess the role of vitamin D in obesity and Type II diabetes mellitus among elderly males.

Materials and Method: The participants were 120 elderly males from the age group of 40 to 60 years divided into two groups on the basis of their Body Mass Index (BMI). Sixty Subjects having BMI < 25 kg/m2 were kept in control group for comparison and remaining sixty subjects having BMI>25 kg/m2 were overweight/ obese included in another group under study. Fasting blood glucose level was determined by using commercially available kits and 75 grams Oral Glucose Tolerance (OGT) test was performed. Body fat content was calculated by body fat analyzer and serum level of vitamin D was measured by immunoassay kits.

Results: The results showed that fasting plasma glucose level was >115mg/dl and plasma glucose level after 120 minutes (OGT test) was >200mg/dl among 35% of the participants having BMI>25kg/m2. Serum vitamin D level was less (35 - 65nmol/liter) and Insulin sensitivity index was also decreased ($r=0.78$, $p<0.01$) among overweight/ obese subjects.

Conclusion: The study suggests that vitamin D deficiency plays very important role in development of insulin resistance leading to obesity and diabetes mellitus type II.

***Keywords*:** *Vitamin D deficiency, Body Mass Index, Oral Glucose Tolerance Test, Diabetes Mellitus type II, Obesity*

INTRODUCTION

Millions of people worldwide suffer from deficiency of vitamin D [25(OH)D][1-4]. It may result from limited sun-exposure, use of sunscreen, low consumption of food containing vitamin D and malabsorption syndrome [5-6]. The vitamin D receptors (VDR) and 1α-hydroxylase enzyme, responsible for conversion of 25-hydroxyvitamin D [25(OH)D] to 1,25-dihydroxyvitamin D [1,25$(OH)_2$D] were found in more than 40 human cell types[7-8], indicating its important role in regulation of numerous metabolic processes. According to recent data, there may be a connection between vitamin D levels and some metabolic diseases like obesity, impaired glucose tolerance and diabetes mellitus type II, arterial hypertension and atherogenic dyslipidemia. Although the mechanisms are still not very clear but vitamin D deficiency has been found to be associated with these pathological conditions [4, 6, 10-14]. Furthermore, an increased body fat content and obesity is associated with low circulating 25(OH)D level [9, 14-19].

Numerous studies have been done to assess the relationship between 25(OH)D and serum level of insulin. Vitamin D receptors have been found in pancreatic beta cells which indicated the possible effects of 1, 25-dihydroxyvitamin D in regulation

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of insulin production[14, 15]. It is well known that treatment of animals with vitamin D slows down the progression of induced diabetes mellitus type I, and that high doses of vitamin D in food reduce the incidence of diabetes among risk-group children[20-23]. It was determined that the lack of vitamin D may cause hyperglycemia and a high risk of diabetes mellitus type II [2,4,5,14,15, 22-24]. There is a link between 25(OH)D levels and insulin responsiveness of tissues as well as between glycosylated hemoglobin and glucose levels in people without diabetes mellitus type II [15, 21]. However, some data from other authors contradict the relation of vitamin D deficiency and metabolic syndrome factors [20,25]. Therefore this study was conducted to assess the relationship between the serum 25(OH)D concentration and obesity as well as diabetes mellitus type II among elderly males.

MATERIALS AND METHOD

The 120 men from the age group of 40 to 60 years participated in this study. The exclusion criteria were: family history, calcium or vitamin D therapy, long or frequent exposure to sunlight, significant liver or kidneys disease and malabsorption syndrome. Their dietary habit and routine physical activity were almost similar. The study was performed over the period from October, 2013 to March, 2014. All participants gave written consent.

Anthropometric measurements of height and weight were done with the use of a calibrated balance beam scale and a wall-mounted stadiometer; calculation of body mass index (BMI); and measurement of waist circumferences (WC) using standard methods. Normal body weight was defined as BMI<25 kg/m^2 an BMI>25 kg/m^2 as overweight/obese [40]. Omron HBF – 358 Body Fat Analyzer was used for measurement of body fat percentage. The fat mass index (FMI) was calculated using fat mass measurement [41,42].

Fasting plasma glucose was determined enzymatically using commercially available kits. Serum insulin was measured using enzyme immunoassay kits (Beckman Coulter, USA). Homeostasis model assessment estimates of ß-cells function (HOMA-B) were calculated using fasting glucose and insulin measurements[43]. Standard 75-g oral glucose tolerance test was performed for all subjects. Insulin sensitivity index (ISI-(0,120)) was calculated using fasting and 120-min glucose and insulin measurements [44].

Serum 25(OH)D was measured using immunoassay kits (Immunodiagnostic System Ltd, UK) with quality control materials. Status of vitamin D was classified as: normal - 25(OH)D level>75nmol/L and deficient <75nmol/L. Serum 25(OH)D level was 90 – 110nmol/L among normal subjects and 35 – 65 nmol/L among the overweight/obese participants[2,8].

Serum intact parathyroid hormone level (iPTH) was detected using ELISA and commercial immunoassay kits (Beckman Coulter, USA).

The data below are represented as means ± standard error or percentage. Statistical processing of the data was performed using the Chi-square test. To find the correlation between the studied indicators we applied Pearson correlation analysis.

RESULTS

The mean age of elderly men was 49.8±2.03 years (from 40 to 60). The mean Body Mass Index (BMI) of normal subjects was 22.8±2.71 kg/m^2 (from 18.5 to 24.9) whereas the mean BMI of overweight/obese subjects found to be 28.9±2.21 kg/m^2 (from 25 to 34.5). The results of the study showed that 22.5% of men were overweight and 27.5% were obese with waist circumference>80 cm, whereas 50% of men had normal weight with WC<80 cm.

Serum 25(OH)D level varied from 35.25 to 110.00 nmol/L and it was less than 75 nmol/L among overweight and obese men. Correlation analysis showed that overweight and obese men had lower 25(OH)D level than men with normal BMI (r=-0.89) (Table 1). We found that risk of obesity was higher among subjects with serum 25(OH)D level <75nmol/L than in subjects with 25(OH)D level >75 nmol/L.

TABLE 1 - Characteristic of Study population on the basis of plasma level of vitamin D:

Variable	Normal 25(OH)D n=60	Deficient 25(OH)D n=60	P value
Age, years	45.3±1.9	51.5±2.1	≥0.05
Weight, kg	66.2±1.8	76.9±2.6	≤0.05
BMI, kg/m^2	22.8±2.7	28.9±2.2	≤0.05
FMI, kg/m^2	12.1±1.1	14.1±1.7	≥0.05
WC, cm	78.4±1.1	89.9±3.4	≤0.05
Total body (%Fat)	22.8±2.1	28.3±2.5	≥0.05
Serum 25(OH)D , nMol/L	95.1±2.3	47.3±2.2	≤0.05
Fasting plasma glucose, mMol/L	4.9±1.1	8.7±0.5	≤0.001
Serum Insulin, IU/mL	10.5±0.2	12.4±0.3	≤0.001
Plasma glucose - 120 min OGTT, mMol/L	6.8±1.3	10.7±0.8	≤0.001
Serum Insulin - 120 min OGTT, IU/mL	20.2±0.4	49.2±0.9	≤0.001
HOMA-B	93.8±1.3	100.4±1.2	≤0.001
Insulin Sensitivity Index	9.9±0.4	7.3±0.3	≤0.001
Intact PTH, pg/mL	41.4±1.5	43.7±1.2	≥0.05

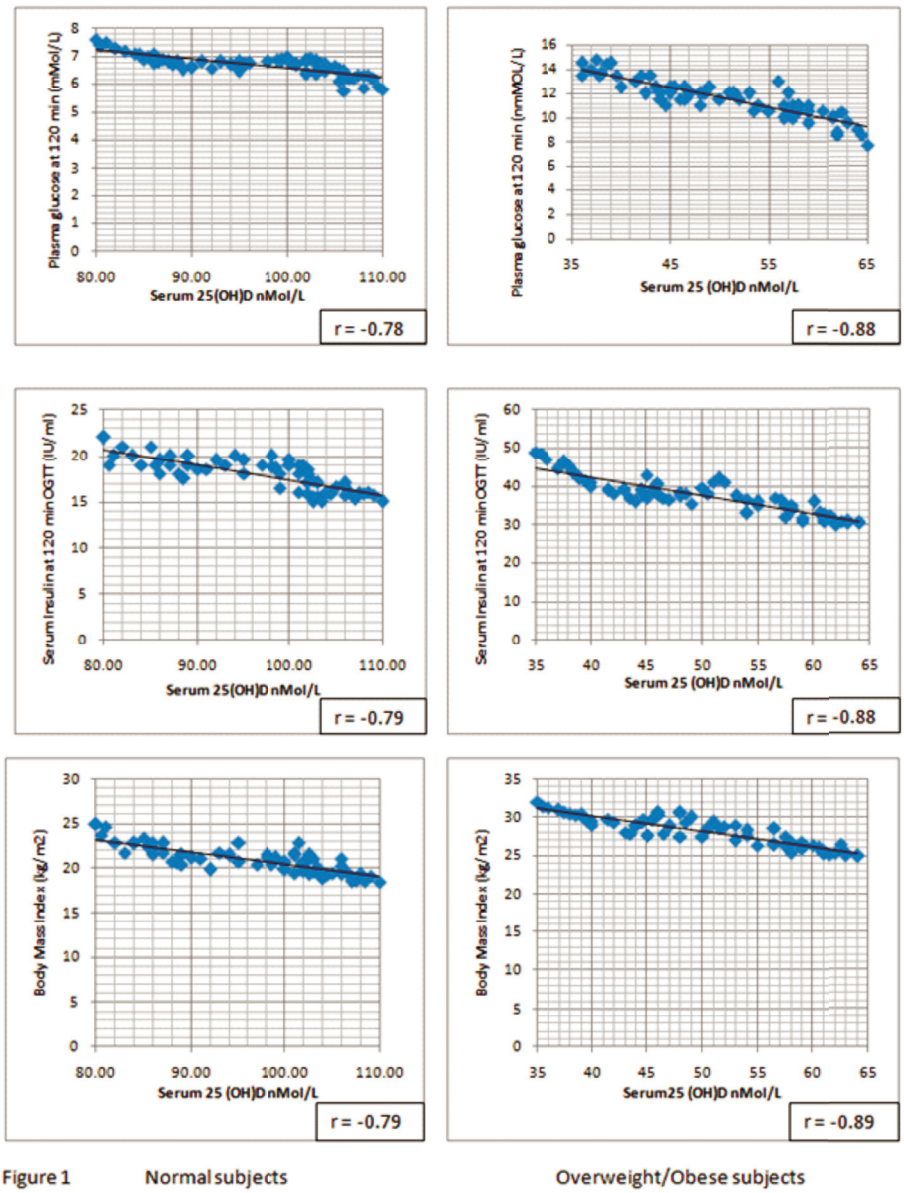

Figure 1- Correlation between serum 25(OH)D nMol/L and other variables:

CHARACTERISTICS OF STUDY POPULATION BY VITAMIN D STATUS

The results showed high level of fasting plasma glucose, and OGT test was positive amongst 35% of the participants where as 65% of the participants showed normal glycemia. We found that in overweight and obese population there were a significant correlation between 2h OGTT glucose and serum 25(OH)D concentration and fasting insulin and serum 25(OH)D levels (Figure 1). Moreover, calcidiol levels in men with normal weight was inversely proportional to Serum insulin- 120 min OGTT (IU/ml) and for those with overweight and obesity they were directly proportional to insulin sensitivity index. Serum intact parathyroid hormone (iPTH) level was normal in total study population (mean 42.3±1.6 pg/mL) and men with obesity had a tendency of negative association between iPTH and 25(OH)D levels.

DISCUSSION

It is well known that incidence of vitamin D deficiency increases in elderly people [1-4,26]. On the other hand, geographic location could play an important role in vitamin D status. St. Petersburg, a North-Western region of Russia, as well as most of other Russian regions, are located higher than 42° North latitude and has approximately 62 sunny days per year, a fact that predispose to sunlight and vitamin D deficiencies. Recent Russian studies showed that around 60% of children and adolescents in Moscow and 43% in St. Petersburg as well as more than half of the elderly population of Yekaterinburg had vitamin D deficiency [27,28]. However, our results revealed a high incidence of vitamin D insufficiency and deficiency in men with sedentary life-style doing work in night. The possible factor that might contribute to the lack of 25(OH)D was less exposure to sunlight. Our results confirmed a high prevalence of obesity, implicating calcidiol deficiency in overweight and obese people [16-18, 29]. Previous studies showed that increased body fat is associated with lower 25(OH)D levels due to calcidiol accumulation in fat tissue, while our results demonstrated that low 25(OH)D level could predispose to fat accumulation.

The presence of VDR in adipocytes suggested that vitamin D plays an important an important role in lipogenesis and lipolysis regulation[19,30]. It was shown that in vitro active form- $1,25(OH)_2D$ - could regulate adipocyte death and decrease fat mass. On the other hand, a reduction in 25(OH)D concentration may lead to an increase in serum iPTH, that lead to regulation of body fat mass, increasing lipogenesis and decreasing lipolysis[31-33]. Our results demonstrated significant associations between iPTH level and fat mass index ($r=0.02$, $p<0.05$) that could confirm this theory.

Obesity has become a global epidemic and a risk factor for diabetes type 2[34-36] also the vitamin D endocrine system could be involved in glucose homeostasis and in insulin release mechanisms. Epidemiological studies suggested that vitamin D deficiency may increase the risk of developing insulin resistance and diabetes[37-39]. Our data indicated the regulatory role of 25(OH)D in the function of pancreatic β-cells and the level of insulin sensitivity. This proposition is supported by correlation between calcidiol levels and stimulated insulin levels, insulin resistance, ß-cells functional activity as well as insulin sensitivity of tissues. However, as shown here, vitamin D deficiency had the most pronounced effect either on insulin secretion by the pancreatic cells in people with normal weight, or, in the case of overweight or obesity, it lead to low tissue insulin sensitivity. Our results are supported by other studies[5,11,15,37,38]. Hence, the beneficial effect of vitamin D in glucose metabolism cannot be ignored as a potential preventive and even therapeutic measure for obesity and diabetes.

Finally, we would like to mention that the limited number and gender of study subjects, outpatient basis of the study, dynamic methods such as euglycemic clamp, and inability to perform accurate assessment of ergocalciferol consumption with food and cholecalciferol synthesized in the skin under the action of ultraviolet light might have affected the data. Future studies to evaluate the impact of 25(OH)D status on weight and glucose metabolism parameters in other populations, such as young children and adolescents are needed.

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Ocular Hypertensive Changes in Menopausal Women - a Need For Screening ?

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ABSTRACT

Background: This study was taken up to evaluate the effects of increased blood pressure and duration of menopause as a risk factor to ocular hypertension in menopausal hypertensive Indian women. Mean intraocular pressure in postmenopausal women is higher than in premenopausal and is positively correlated with increase in blood pressure.

Ocular hypertension is the intraocular pressure more than 21 mmHg in atleast one eye, having normal visual fields and normal optic nerve head ",which may progress to glaucoma with significant visual morbidity if not screened".

Objectives

1. To study the effects of elevated blood pressure on IOP in menopausal women.

2. To study the risk of increased blood pressure and the duration of menopause on Ocular Hypertension

Methodology: A clinical comparative case-control study was conducted in postmenopausal women (45-55 yrs) with 40 hypertensives (cases) and 40 normotensives (control).who gave written informed consent. They were selected as per inclusion and exclusion criteria. The intra ocular pressure (IOP) was recorded by caliberated Schiotz Indentation Tonometer in the morning hours . Blood pressure was recorded by Sphygmomanometer in supine position

Results: 1. The mean Intraocular pressure in normotensive menopausal women was 16.16 ±2.19 mmHg and in hypertensive subgroup it was 18.63± 2.88 mmHg (student 't' test, p=0.001)

2. Among the 80 postmenopausal women , 17 had an IOP > 21 mmHg (ocular hypertension) of which 16 belonged to the hypertensive and one to normotensive groups. (z test, $p<0.05$).

3. Of the 16 ocular hypertensives , 7 had a history of duration of menopause greater than 4 yrs .

Conclusion: This study showed that postmenopausal hypertensive women are at a higher risk of developing Ocular Hypertension and thus signifies the need for regular screening for an elevated IOP.

Keywords : *Ocular hypertension , Intraocular pressure , Menopause*

INTRODUCTION

About 60 million women in India are in the age of 55 yrs. With improved life expectancy among women, a majority would spend 1/3 of their life in the postmenopausal age[1]. Increasing age decreases

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the physiologic reserve of eye and cardiovascular system which may manifest in the form of IOP and BP changes[2]. The incidence of eye disease increases with age and can often be linked to worsening cardiovascular function and increasing intraocular pressure[3]. Intra ocular pressure (IOP) is maintained by the equilibrium between aqueous production from ciliary body and its drainage via trabecular complex and uveoscleral outflow.

Elevated IOP is one of the major risk factor for developing glaucoma and glaucomatous neuropathy[4]. IOP was positively and independently correlated to systemic BP[5].

In India, glaucoma is one of the 3rd most commonest cause for blindness, with a prevalence of 3.07% (camp based study) and has a slight female preponderance[7]. Knowledge of IOP in different stages of female sexual life would enable the screening for ocular hypertension and follow up of open angle glaucoma[6].

AIMS & OBJECTIVES

1. To study the effects of elevated blood pressure on IOP in menopausal women.

2. To study the risk of increased blood pressure and the duration of menopause on Ocular Hypertension .

METHODOLOGY

This was a clinical comparative case- control study done in postmenopausal women in the age group of 45-55 yrs. About 80 postmenopausal women were selected for the study, of which 40 were hypertensives (study group) and 40 were normotensives (control group).

A prestructured proforma was used to collect the baseline data .Those who satisfied the inclusion & exclusion criteria were clinically & Ophthalmologically ruled out for glaucoma if any, by an Ophthalmologist.

INCLUSIONS

Women with history of one year of amenorrhoea and above the age of 45 yrs.

CONTROL GROUP

40 Post menopausal normotensives

STUDY GROUP: 40 post menopausal hypertensives

EXCLUSIONS

1. H/o Ocular surgeries
2. H/o Ocular trauma
3. Blind Subjects
4. H/o an medical / surgical illness
5. H/o oral contraceptive pills use
6. H/o drugs intake
7. H/o irradiation therapy
8. H/o surgical hysterectomy
9. Family H/o glaucoma

IOP was recorded by caliberated Schiotz Indentation Tonometer, in supine position between 10am-1 pm to prevent diurnal variations. After anaesthetizing the cornea with 4% lignocaine drops, the gaze was fixed. IOP was recorded placing the footplate of tonometer on the surface of cornea. The IOP reading was derived using friedenwald nomogram (a conversion table). Blood pressure was measured by caliberated sphygmomanometer in supine position.

STATISTICAL METHODS

Descriptive & Proportion statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. Student 't' test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups Inter group analysis. The Statistical software namely SPSS 15.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data .

RESULTS

Table 1: Comparison of Anthropometric parameters, Hemodynamics and IOP between normotensive and hypertensive in Post-menopausal women

Study variables	Normotensive	Hypertensive	P value
Age in years	50.88±2.64	51.68±2.27	0.150
SBP (mm Hg)	117.90±6.88	134.40±7.65	<0.001**
DBP (mm Hg)	75.10±5.10	84.05±7.20	<0.001**
IOP (mm Hg)	14.70±2.65	18.63±2.88	<0.001**

The mean IOP in postmenopausal normotensive & hypertensive were 14.70±2.65 mmHg & 18.63±2.88 mmHg respectively (P<0.001)

Table 2: Mean IOP according to SBP in Post-menopausal women

SBP in Post-menopausal women	Number of subjects	IOP (mm Hg)
		Mean
<120	12	14.74±2.84
120-139	52	16.36±3.20
140-159	16	19.11±3.16
P value	80	F=7.326; P=0.001**

Relationship between SBP & IOP:

The mean IOP with SBP < 120 was 14.74 ± 2.84 mm hg, 16.36 ± 3.20 (120-139) & 19.11 ± 3.16 (SBP=140-160) (f=7.326, p=0.001).

Table 3: Mean IOP according to DBP in Post-menopausal women

DBP in Post-menopausal women	Number of subjects	IOP (mm Hg)
		Average
<80	28 (35.0%)	15.79±2.75
80-89	41(51.3%)	16.79±3.62
90-99	11(13.8%)	18.38±3.54
P value	80(100.0%)	F=2.444; P=0.094+

RELATIONSHIP BETWEEN DBP & IOP:

The mean IOP was 15.79 ± 2.75 (DBP<80), 16.79 ± 3.62 (80-89) & 18.38 ± 3.54 (90-99) mm Hg. (f=2.444;p=0.094+)

Table 4: Levels of IOP (mm Hg) in pre –menopausal and Post menopausal women

Status	Number of patients	IOP (>21 mm Hg) (ocular hypertension)	
		Right	Left
Pre-menopausal	80	3(3.8%)	0
Post-menopausal	80	14(17.5%)	6(7.5%)
Total	160	0.009**	0.028*

RELATIONSHIP BETWEEN OCULAR HYPERTENSION & DURATION OF MENOPAUSE

Among the 80 postmenopausal women , 17 had an IOP > 21 mm Hg (Ocular hypertension) of which 16 belonged to the hypertensive and one to the normotensive subgroups (z test, $p<0.05$).

Of these 16 ocular hypertensive women (study group) 7 had an history of duration of menopause greater than 4 years. But it was not found to be statistically significant.

DISCUSSION

Population based studies have shown that the mean IOP with age is greater in women than men in the older age groups. This probability occurs due to age related reduction in the aqueous outflow facility & a decrease in the aqueous production.

Studies have shown that IOP is higher among postmenopausal women when compared to premenopausal [6] . Few studies have opined that the knowledge of IOP changes across various stages of female sexual life, would enable screening and appropriate follow up for open angle glaucoma.

In this study ,it was found that, IOP was significantly associated with SBP & DBP in hypertensives when compared to normotensives . About 16 hypertensive women (out of 40) had an IOP > 21 mm Hg (ocular hypertension) , at least in one eye having normal visual fields and normal optic nerve head.

The possible mechanisms of elevated IOP among postmenopausal hypertensive women would be as follows:

1. Increased retinal blood volume after a rise in the central retinal vein pressure because of increased pressure in the adjacent central retinal artery[7]
2. Increased blood volume in the ciliary body and increased facility of aqueous outflow owing to an increase in resistance in the episcleral and anterior ciliary veins. Increased ultrafiltration [8] of aqueous fluid in the ciliary body owing to the increased perfusion pressure in the ciliary arteries [9,10] .
3. Obstruction to the aqueous drainage at the anterior chamber angle [7] by increasing episcleral venous pressure which is important in regulating the flow of aqueous across the trabecular meshwork into the schlemm's canal [5,10]. It was hypothesized that increased blood pressure in early course of systemic hypertension , prior to the onset of small vessel damage ,might result in increased blood flow / greater hydrostatic resistance to closure of smaller vessels & therefore protect the ganglion cells & their axons from damage [11].
4. Elevated IOP may be thought of as a physiological equilibrium state in response to high blood pressure and may involve a compromised vascular autoregulatory mechanism [12,13], resulting as a damage to the small vessels of the optic disc and mechanical strain on the optic nerve as it passes through the lamina cribrosa [11].
5. Several investigators have reported that nitric oxide induces a decrease in intraocular pressure by relaxation of the trabecular meshwork[14,15]. Moreover as a vasodilator , nitricoxide may have an effect on the blood supply of the optic nerve and the basal vascular tone in uveal, retinal, and choroidal circulation[16,17] .
6. It may be assumed that the decrease in estrogen and progesterone levels after menopause may play a role & therefore biologic mechanisms influenced by these hormones may be involved. Estradiol increases endothelial nitric oxide levels by increasing the activity of the enzyme nitric oxide synthase-3[18,19].
7. There is an evidence that progesterone has the properties of a glucocorticoid antagonist. Glucocorticoids elevates IOP. Progesterone may inhibit the ocular hypertensive effect of endogenous glucocorticoids by competing for the receptor binding site. These receptors are located in human trabecular meshwork cells and rabbit iris-ciliary body cells binding both glucocorticoids and progesterone[20].

CONCLUSION

This study would emphasizes that , Indian postmenopausal women who are hypertensives showed a positive association between elevated IOP and systemic hypertension (both SBP & DBP) , when compared to normotensives.

Postmenopausal hypertensives were more prone to develop Ocular Hypertension (IOP >21 mm Hg) when compared to normotensives. Elevated IOP was

also found to be positively co-related to duration of menopause .

These results would recommend for a regular population based screening, for an elevated IOP / Ocular Hypertension among women during their menstrual transition period. This monitoring could reduce the risk of progression to primary open angle glaucoma , which is one of the most commonest causes of irreversible blindness worldwide & in India.

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A Study of Electrocardiograph (ECG) Measurement before Elective non-Cardiac Surgery in a Tertiary Hospital

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ABSTRACT

Cardiovascular complications are a major cause of preoperative morbidity and mortality in patients undergoing no cardiac surgery. So this study was planned to find out the occurrence of ECG abnormalities in preoperative patients posted for elective non cardiac surgery . A retrospective evaluation of ECG involving 125 patients posted for elective non-cardiac surgery at Viswabharathi Medical College General Hospital, Kurnool was done. ECG abnormalities found in 45 cases (36.20%) out of 125 preoperative patients. Sinus tachycardia and sinus bradycardia were the common ECG abnormalities Hypertensive (65.8%) and diabetic (73.6%) patients had higher incidence of abnormal preoperative ECG when compared to their normal counterparts (p-value <0.001). In conclusion, there must be an ECG prior to any elective surgery because preoperative testing offers a stage for detection of asymptomatic significant cardiac abnormalities.

Keywords: *ECG, pre-operative patients, non- cardiac surgery, sinus tachycardia*

INTRODUCTION

Preoperative risk is multifactorial and depends on the medical condition of the patient, the invasiveness of the surgical procedure and the type of anesthetic administered.[1]

Cardiovascular complications are a major cause of preoperative morbidity and mortality in patients undergoing no cardiac surgery. Neither preoperative ECGs nor results of preoperative screening questionnaires were predictive of adverse cardiovascular preoperative events questioning the utility of preoperative ECGs in the ambulatory surgery setting, in younger, relatively healthy patients.[2] Age, increased physical status score, and male gender were associated with a greater incidence of abnormal preoperative ECGs.[2]

For the purpose of the preoperative assessment, an ECG is considered abnormal when the following abnormalities are present - some abnormal rhythms (atria fibrillation/flutter, pacemaker rhythm, and ventricular extra systoles). pathological Q waves, left ventricular hypertrophy, ST-T changes, conduction defects etc.(disease requiring surgical intervention)

Finally, a cardio logical assessment is indicated if the ECG is abnormal. Routine electrocardiography has the potential to detect diseases those can have impact on preoperative care in selected patients. The availability of an ECG may be useful in determining if it is appropriate to proceed.[3]

Patients with coronary artery disease undergoing major non-cardiac surgery guidelines concerning preoperative evaluation, stress testing, coronary angiography, and revascularization is justified.[4]

Based on the American College of Cardiology and American Heart Association guidelines and data from contemporary studies, patients without risk

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factors are considered to be at low risk and do not require additional evaluations for coronary artery disease. Patients with 1 or 2 cardiac risk factors represent an intermediate-risk group for preoperative cardiac complications Patients with 3 or more risk factors are at high risk for cardiac complications and the use of noninvasive testing may help further refine cardiac risk based on the presence and absence of test-induced myocardial ischemia.[5] Noninvasive testing offers only limited assistance in estimating risk for these patients.[6] However a study was planned to assess the utility of routine ECG in clinically stable preoperative patients. So the aim of the study was to find out the incidence of ECG abnormalities in preoperative patients posted for elective non cardiac surgery and also to access the co-relation of risk factors with ECG abnormalities.

METHOD

This study was a retrospective evaluation of ECG involving 125 patients posted for elective non-cardiac surgery at Viswabharathi Medical College General Hospital, Kurnool. A detailed history was taken in order to find out the risk factors. These patients were advised ECG for preanesthetic checkup. Institutional ethics committee approval was taken prior to the start of study. Exclusion criteria were pregnant females, hemodynamically unstable patients and those undergoing emergency surgeries. Clinical examination was done as per proforma followed by recording of 12 lead ECG in all the patients in addition to routine biochemistry and chest x ray. This study was conducted over a period of 6 months from January 2012 to June 2012.

Electrocardiographic (ECG) results with atrial fibrillation, left or right bundle branch block, left ventricular hypertrophy, premature ventricular complexes, pacemaker rhythm, or Q-wave or ST-segment changes and QT prolongation and rhythm abnormalities were classified as abnormal. Data collected were expressed in percentage (%) and to know the test of significance chi-square test was used. The level of significance was set at $P<0.05$.

RESULTS

80 males and 45 females were enrolled for this study. Out of these 125 cases, 20 (16.3%) cases were from general surgery, 35 (28.8%) orthopedics, 40 (32.1%) ophthalmology, 15 (12.1%) ENT and 15 (12.1%) from gynecology department (table-1).

70 cases out of total cases had a risk factor or disease; 6(8.66%) had history of cardiovascular disease, 20(28.99%) with hypertension, 15 (21.35%) with diabetes and 29 (41.20%) were smokers (Fig-1).

Preoperative ECG was normal in 80 (64.50%) and abnormal in 45 (36.50%) patients.

Sinus tachycardia was the most common rhythm abnormality observed in 15 (18.81%) cases. Other rhythm abnormalities were sinus bradycardia in 9 cases (8.25%), ventricular premature complexes in 3 cases (1.55%).

Conduction defects included first degree heart block in 3 cases (2.59%), left bundle branch block in 1 case (0.52%), complete right bundle branch block in 3 (4.14%), incomplete right bundle branch block in 1 case (0.52%) and left anterior hemi block in 3(5.69%) cases. Left atrial enlargement in 3 (1.036), biatrial enlargement in 1(0.52%), left ventricular hypertrophy is present in 5 cases (3.11%)

Further , ECG abnormalities consist of Infer lateral ischemia in 2 cases (1.55%), anterior wall ischemia in 2(1, 55%). ECG changes suggestive of old myocardial infarction were present in 3 cases (2.59%). Additional changes include poor progression of R wave in 2(1.55%), and prolonged QT in 1 (0.52%).

Hypertensive patients had higher incidence of abnormal preoperative ECG 13/20 (65.88%) compared to normotensives (p value<0.0001) and even diabetic patients had higher incidence of abnormal ECG 11/15 (73.61%) versus non-diabetics (p value <0.0001.). Patients with known cardiovascular disease had higher incidence of abnormal ECG 4/6 (67.89%) than without cardiovascular disease (p value<0.001). 20 (68.41%) smokers versus 29 non smokers had abnormal ECG (p value <0.0001.).

DISCUSSION

Our study showed that majority of preoperative ECG was normal and preoperative testing should generally be directed by a targeted history, physical examination, and the relevance of any tests should be considered in light of the type of procedure that is planned, particularly the hemodynamic changes and blood loss involved.

This study detected ECG abnormalities in 45

preoperative patients. Common ECG abnormalities included sinus tachycardia and sinus bradycardia . Rationally sinus tachycardia is not an abnormality requiring cardiac intervention.

Hypertensive and diabetic patients had higher incidence of abnormal preoperative compared to normotensives subjects. Patients with known cardiovascular disease also had higher incidence of abnormal ECG. Moreover, ECG abnormality increased with every decade after 40

Some studies have questioned the utility of preoperative ECG for screening asymptomatic individuals undergoing a variety of surgical procedures but they concur to the point that clinical risk factors should form the basis of risk assessment and prediction.[7] Further the usefulness of its routine use in lower risk surgery is questionable.[8]

Even though, electrocardiogram (ECG) monitoring has been included in the minimum mandatory monitoring guidelines, but there is no complete accord as to which patients should have a preoperative ECG.[9]

The objective of the preoperative cardiac risk assessment is to evaluate the presence and degree of coronary artery disease along with other risk factors such as cerebrovascular disease, renal insufficiency, and diabetes mellitus that may influence the preoperative risk of this patients.[10]

Patients with >or=3 risk factors or active cardiac conditions should undergo stress testing.[11]

Performing routine screening tests in patients who are otherwise healthy is invariably of little value in detecting diseases and in changing the anesthetic management or outcome.[12]

Our study strengthens the importance of preoperative ECG monitoring in those with risk factors like diabetes, hypertension and cardiovascular disease.

We suggest that there is a need for an ECG prior to any elective surgery because preoperative testing offers a stage for detection of asymptomatic significant cardiac abnormalities that may require further follow up in future.

Table 1 Distribution of Cases According to Surgery

Surgeries	Male	Female	Percentage of total cases
General Surgery	09	11	16.3%
Orthopedics	25	10	28.4%
Ophthalmology	28	12	32.3%
ENT	10	5	12.1%
Gynecology	0	15	12.1%
TOTAL	72	53	

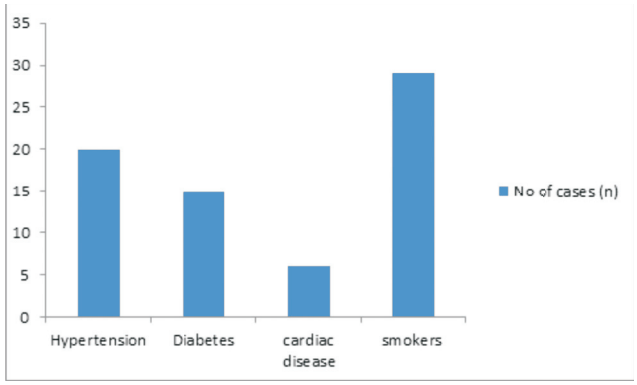

Figure 1: Risk factors of the pre-operative patients

CONCLUSION

ECG being a simple non-invasive and economical tool should be done to all patients undergoing elective procedures and it must be mandatory for those with risk factors.

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Evaluation of Effects of Age on Parasympathetic Status in North Indian Subjects

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ABSTRACT

It has been claimed that an appropriate sympatho-parasympathetic balance is necessary for proper regulation of cardiovascular and other important reflexes. Any sympatho-parasympaathetic imbalance may predispose the subject to cardiovascular and metabolic complications like angina pectoris, hypertension, metabolic syndrome etc. It may also increases susceptibility for cardiovascular emergencies like acute myocardial infarction, stroke etc.

It has been postulated that decline in parasympathetic tone with age may lead to sympatho-parasympathetic imbalance in geriatric subjects. We have assessed parasympathetic tone of healthy subjects (all three age groups young, middle age and elderly) using a battery of parasympathetic function tests. Our results show persistent decline of parasympathetic tone with age.

A lot of research work has been done on this topic in the recent past but different researchers inferred different conclusions. This is also an important reason to further explore this topic.

It is claimed that some regular maneuvers (like yoga, meditation, deep breathing exercise etc.) can delay decline in parasympathetic status. Thus it can be postulated that by doing these regular maneuvers many complications of old age can be avoided.

Keywords: *Age, Parasympathetic System, Indian subjects, Autonomic Nervous System*

INTRODUCTION

Autonomic nervous system (ANS) is an important component of nervous system, which controls many visceral functions like cardiovascular, gastrointestinal reflexes, bladder control, sexual functions etc. It has mainly two components, sympathetic nervous system (SANS) and parasympathetic nervous system (PANS). The earlier has norepinephrine as main neurotransmitter except at some places such as sweat glands where the neurotransmitter is acetylcholine while, the later system exclusively has acetylcholine as the main neurotransmitter[1,2]. But relatively recently, a third subsystem of neurons of ANS has been named enteric nervous system (ENS) which contains 'non-adrenergic and non-cholinergic' neurotransmitters (5-HT, VIP, ATP, nitric oxide and Substance- P as neurotransmitters). It has been described and found to be integral in autonomic functions, particularly in the gut and the lungs[3].

Among all three components of ANS, parasympathetic part plays very important role in body physiology as it is responsible for stimulation of "rest-and-digest" or "feed and breed" activities that occur when the body is at rest, including sexual arousal, salivation, lacrimation , urination, digestion and defecation. Its actions are described as being complementary to that of one of the other main branch of the ANS, i.e., the sympathetic nervous system[4].

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The parasympathetic nerves are autonomic branches of the peripheral nervous system. Its nerve fibers arise from the central nervous system with the S_2, S_3, and S_4 spinal nerves and from the third, seventh, ninth, and tenth cranial nerves[5]. Because of its location, the PANS is commonly referred to as having "craniosacral outflow" unlike the SANS which is said to have "thoracolumbar outflow".

About 75% of all parasympathetic nerve fibers are carried along with the Vagus nerves thus passing them to the entire thoracic and abdominal regions of the body. Therefore a physiologist speaking of the parasympathetic nervous system often thinks mainly of the two Vagus nerves[5].

The PANS promotes digestion and the synthesis of glycogen[6] and allows for normal function and behavior. The deterioration in parasympathetic response with age may lead to many age related complications like arrhythmia, constipation, impaired bladder control, impotency etc. If decline in parasympathetic response with age is retarded by any means, many complication of old age can be postponed for few years or prevented at all.

This study included Deep breathing test[7,] Valsalva maneuver[8], and Heart rate response to change in posture[9] from lying to standing as a tool to assess the parasympathetic status in three adult age groups.

MATERIAL AND METHOD

Selection of Subjects: Sixty two subjects of both sex between 25-80 years of age participated in the study after obtaining the approval of Institutional Ethical Committee of LLRM Medical College, Meerut, India. The subjects were enrolled after obtaining the Informed consent and having no history of diabetes, hypertension and any cardiac disease or other illness involving parasympathetic nervous system.

They were classified into three groups on the basis of age, group I consists of younger age participants (25-45 yrs.), group II includes middle age (46-60 yrs.), and group III involved old age (above 60 yrs.).

All the subjects chosen for assessment of parasympathetic status were apparently healthy. They were thoroughly assessed by detailed history and clinical examination to rule out any disease involving parasympathetic nervous system i.e. diabetes, hypertension, arrhythmia etc. Detailed drug history was taken to rule out any medication affecting parasympathetic functions or cardiovascular system. All the subjects were nonsmokers and nonalcoholic.

LABORATORY CONDITIONS AND RECORDING OF PERSONAL AND CLINICAL DATA

Each test was performed under thermo neutral conditions and at the same time of day in all the subjects. The tests were conducted according to the recommended protocol used in clinical studies. The subjects were abstained from coffee or tea for 6 hours before parasympathetic function tests. A light breakfast was allowed 2 hours before tests. All the measurements were performed between 11.30 am to 2.30pm in an isolated autonomic function laboratory of the Physiology department, the temperature of which was maintained between 25 degree C and 27 degree C.

After taking consent subject's personal data were recorded and anthropometric measurements like height, weight and BMI were recorded. Blood pressure (BP) of all the subjects was recorded using mercury sphygmomanometer and stethoscope by standard Korotkoff method and heart rate by an automatic ECG recording machine (ASPEN) and whole one minute pulse rate was recorded.

RECORDING OF TESTS TO DETERMINE PARASYMPATHETICSTATUS OF SUBJECTS

A battery of non-invasive parasympathetic function tests was performed to evaluate parasympathetic tone of all subjects.

DEEP BREATHING TEST

The subject was instructed about the test. It was explained that breathing should be smooth, slow, and deep. The investigator provided the hand signal to the participants to maintain the rate and timing of the breathing. For 6 cycles per minute, the inspiration was done for 5 sec and expiration for 5 seconds. If cycles were not appropriately done, it was repeated again in order to get 6 complete cycles.(i.e. each cycle consisting of 5 sec. inspiration followed by 5 sec. expiration)[10,11,,12].

RECORDING

A baseline recording of ECG and respiration was taken for 30 seconds. After that deep breathing test was started and recording of respiration and ECG was continued for throughout the test i.e. for one min. Calculation was done from the tracing of respiration and ECG.

CALCULATION

E: I ratio was calculated from longest R-R interval during expiration, divided by shortest R-R interval during inspiration averaged over 6 cycles.

LYING TO STANDING TEST (30:15 RATIO)

The subject was instructed about the test. The test was conducted after 10 minutes of supine rest. Then he was told to attain the standing posture within few seconds and recordings were taken[10,11,12].

Recording: The ECG was recorded for 30 seconds to get the baseline values and for 1 minute during standing position.

Calculation: Lying to standing ratio or 30:15 ratio was calculated as the ratio between longest R-R interval at or around 30th beat and the shortest R-R interval at or around 15th beat.

VALSALVA MANEUVER

Valsalva maneuver can be done in many ways. Our study utilized the standard protocol of the ANS function laboratory at All India Institute of Medical Sciences, Delhi. It was performed in sitting position .The patients blew into a mouthpiece attached to sphygmomanometer. The expiratory pressure was kept at 40 mmHg for 15 seconds. A small air leak in system was useful to prevent the closure of glottis during the maneuver. At the end of 15 seconds the pressure was released and due care was taken to prevent deep breathing before and after the maneuver[10,11,12].

Recording: The ECG and stethogram was recorded for one minute to get the baseline values and continuously recorded during the maneuver and 30-45 seconds following release of respiratory strain.

Calculations: Valsalva ratio was calculated from longest R-R Interval during phase IV divided by shortest R-R interval during phase II.

RESULTS

The study involved 36 males and 26 females participants (Table 1). All the 62 participants in our study have matched BMI having an average of 21.37. There was gradual increase in pulse rate as the age advances through group I (Gr I), group II(Gr II) and Group III(Gr III) with significant statistical difference among the groups (Table 2). All the three parameters i.e., E:I ratio, L:S ratio and Valsalva ratio, used in our study to measure the status of parasympathetic system showed gradual decline as the age advances(Table 3) . The Table 3 shows the highly significant ($p<0.001$) decline of E:I ratio, L:S ratio and Valsalva ratio with respect to the advancing age .

STATISTICAL ANALYSIS OF DATA

All the results are expressed in mean ± S.D and all the three groups are compared with each other. The data has been analyzed by using one way ANOVA. The P values less than 0.05 is considered statistically significant.

DISCUSSION

The ANS plays very important role in control of most of the visceral functions . For appropriate control of visceral functions proper sympatho-parasympathetic balance is necessary. With advancing age sympatho-parasympathetic balance goes in favor of SANS. These increases in regional sympathetic activity or decline in parasympathetic tone are associated with development of the metabolic syndrome and increased mortality[13]. Many of the complications of old age especially cardiovascular complications and metabolic complications may be attributed to sympatho-parasympathetic imbalance i.e. increase in sympathetic status or decline in parasympathetic tone. In addition it also has been claimed that many of the cardiovascular causes of sudden death like acute myocardial infarction, stroke etc. are more prevalent in old age than in young adults due to sympatho-parasympathetic imbalance.

In contrast to sympathetic nervous system much research work has not been done on the topic of parasympathetic tone and age. Previously few studies on this topic have been reported on south Indian people. In the past studies and present study gold standard tests like E:I ratio on deep breathing test, Valsalva ratio on Valsalva maneuver and 30:15 ratio on posture change are used for measurement of parasympathetic tone.

The results of our study shows that, as measured by deep breathing test (E:I ratio) parasympathetic status persistently decline with age. These results are corroborating with results of studies of previous researchers like Vinutha Shankar MS[14] et al. (2012). They found persistent decline from young to middle age towards old. Similarly another study done by Melo RC[15] et al. (2005) also find decline in parasympathetic status with age as measured by E:I ratio.

In addition to that our study demonstrated the consistent decline of Valsalva ratio as calculated on Valsalva maneuver through different age groups. The findings are corroborating with some previous studies like study of Kevin D. Monahan, Frank A. Dinenno[16] et al (2001) and David A. Gelber, Michael Pfeifer[17] et al. (1997) who concluded that parasympathetic tone as measured by Valsalva ratio show statistically significant decline with age.

Besides this according to our study 30:15 ratio on lying to standing test also show consistent decline with ages. This finding is in accordance with other previous studies like studies of Yujiro Yamanka, Koichi Honma.[18] et al.(2006) and Christofer T. Minson, Stacey L. Wlodkowski[19] et al(1999).

From above discussion it may be concluded that strengthening of parasympathetic tone may be used as a tool to delay sympatho-parasympathetic imbalance and to avoid most of age related or other lifestyle related complications. Many methods have been recommended to potentiate the parasympathetic tone and make the sympatho-parasympathetic balance appropriate. The first is yoga, unlike most forms of exercises, yoga is not physically demanding, and is often perceived to be very relaxing. Regular engagement in a yoga regimen causes significant decreases in stress hormones, such as cortisol, and has an overall positive effect on our parasympathetic nervous system[20].

The other one is deep breathing. According to some physiologists practicing deep breathing on regular basis potentiate the parasympathetic tone. Deep breathing helps to convince the body that, there is no immediate danger and allows the parasympathetic nervous system to regain control[21]. Another activity that can benefit the parasympathetic nervous system is meditation, which has profound stress-relieving abilities and can be very effective at improving the parasympathetic nervous system[22,23]. One other tool that can surprisingly have beneficial effects on the parasympathetic nervous system is light jogging. While most forms of running are done with high intensity and will typically activate the sympathetic nervous system, light jogging potentiates parasympathetic nervous system.

Thus by application of above mentioned methods proper sympatho-parasympathetic balance could be maintained and all the late cardiovascular and metabolic complications can be delayed or avoided at all.

TABLES

Table 1: Gender wise Distribution in different Groups

SEX	Group I	Group II	Group III
Male	09 (45%)	15 (75%)	12 (54.54%)
Female	11 (55%)	05 (25%)	10 (45.46%)
Total (62)	20	20	22

Table 2: Basal pulse rate (beats/min) in different studied groups

Groups	Group I	Group II	Group III	Total (62)	P value
No. of cases	20	20	22	62	0.009
Mean	79.5	79.85	87.23	82.35	
S.D	7.70	8.92	9.89	9.50	

Table 3: Comparison of Parasympathetic Reactivity with advancing age

Para-sympathetic test	Group I (n = 20)	Group II (n = 20)	Group III (n = 22)	P Value
	Mean ± S.D	Mean ± S.D	Mean ± S.D	
E:I ratio	1.46 ± 0.17	1.28± 0.12*	1.16± 0.07†	<0.001(for both * and †)
L:S ratio	1.29 ± 0.22	1.05 ± 0.06*	0.99 ± 0.03†	<0.001(for both * and †)
Valsalva ratio	1.46 ± 0.18	1.34 ± 0.22*	1.13 ± 0.07†	<0.001(for both * and †)

* Comparison between Group I and Group II(P<0.001) – highly significant.

† Comparison between Group II and Group III(P<0.001) – highly significant.

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Effect of Alternate Nostril Breathing on Cardiovascular Parameters in Obese Young Adults

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ABSTRACT

Obesity is common problem in young adults of high socioeconomic status. In association with stress, it predisposes them at a high risk for development of hypertension and other cardiovascular diseases at a very young age. Alternate nostril breathing (ANB) is a pranayama yogic exercise, deemed to relieve stress and related disorders. Present study was conducted to assess the effect of alternate nostril breathing on cardiovascular parameters in obese young adults belonging to high socioeconomic status. Sixty asymptomatic healthy male subjects, aged 25-35 years, participated voluntarily in the present study. Based on BMI, subjects were divided into two groups. Group -A comprised of non-obese subjects (BMI<25) and group -B comprised of obese subjects (BMI>30). Systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) were recorded by using automatic digital sphygmomanometer before and after Alternate Nostril Breathing (ANB) exercise of 15 minutes. Data obtained were analyzed using paired t-test. Statistically significant decrement was observed in all cardiovascular parameters viz. Systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) after ANB exercise in both groups A & B. However decrease in all these parameters was more significant in obese subjects of group –B.

Keywords: *Alternate Nostril Breathing, Obesity, BMI, Blood Pressure, Heart Rate*

INTRODUCTION

Obesity is a state of excess adipose tissue, mainly affecting people of high socioeconomic status of all age group. Obesity can result from increased energy intake, decreased energy expenditure, or a combination of the two. In high socioeconomic status increased energy intake is due to overeating and decreased energy expenditure is due to inadequate physical exercise, both leading to obesity. Most widely used method to gauge obesity is the body mass index (BMI), which is equal to weight/height^2 (in kg/m^2). Other methods used to measure obesity include anthropometry (skin-fold thickness), densitometry (underwater weighing) and electrical impedance. Based on unequivocal data of substantial morbidity, a BMI of 30 is most commonly used as a threshold for obesity in both men and women. Many of the most important complications of obesity, such as insulin resistance, diabetes and hypertension in women, are linked more strongly to intra abdominal and/or upper body fat than to overall adiposity. Obesity is an independent risk factor for cardiovascular disease including coronary disease, stroke, and congestive heart failure (CHF). When the additional effects of hypertension and glucose intolerance associated with obesity are included, the adverse impact of obesity is even more evident. Obesity leads to reduced work capacity, mental irritation, dyspnoea [1, 2]. Obesity is also associated with high-normal blood pressure/ prehypertension state which may progress to stage 1 or 2 hypertension. Positive correlation exists between obesity and arterial pressure. A gain in weight is associated with an increased frequency of hypertension in persons with previously normal

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blood pressure, and weight loss in obese persons with hypertension lowers their arterial pressure and, if they are being treated for hypertension, the intensity of therapy required to keep them normotensive. Obesity-induced hypertension is associated with increased peripheral resistance and cardiac output, increased sympathetic tone, increased salt sensitivity, and insulin-mediated salt retention; it is often responsive to modest weight loss [3, 4].

Sympathetic nervous system hyperactivity is most apparent in younger persons with hypertension, who may exhibit tachycardia and an elevated cardiac output. However, correlations between plasma catecholamines and blood pressure are poor. Insensitivity of the baroreflexes may play a role in the genesis of adrenergic hyperactivity, and polymorphisms in the phosducin gene have been linked to increased blood pressure responses to stress [4, 5].

Various yogic exercises have been used to get rid of stress. Alternate-nostril breathing (ANB) or Anulom-Vilom is a type of pranayama that involves alternation in nostril breathing. It may alter cardiovascular and autonomic parameters. Sympathetic over-activity is one of major cause of hypertension. Obesity along with it further worsens the condition. Several investigations have suggested that ANB leads to a shift in sympathovagal balance towards parasympathetic dominance and reduces sympathetic activity. Many researchers have found a significant reduction in heart rate (HR) and blood pressure (BP) both after acute and 8 wks ANB in normal healthy adults[5, 6].

Both nostrils do not work simultaneously; instead they work alternately in a cyclic manner [7]. Still alternate nostril breathing of yogic type seems to influence parasympathetic nervous system. According to yoga, this phenomenon is a consequence of the alternation of the flow of subtle energy in the Ida and Pingala [8]. Blood pressure and heart rate tend to increase with sympathetic stimulation and tend to decrease with increase in parasympathetic activity. Change in blood pressure and heart rate is good indicator of change in autonomic status. Measurement of blood pressure and heart rate is less time consuming easy procedure and can be implicated on large population as well [9-11].

Obesity is a common morbid clinical condition in population of high socioeconomic status of all age group including children and young adults and is predisposing factor for hypertension so any maneuver which may decrease blood pressure or heart rate or both may be helpful in prevention from hypertension and other cardiovascular diseases in obese people. Therefore, the present study aims to study the effect of alternate nostril breathing on cardiovascular parameters in obese young adults.

MATERIAL AND METHOD

The present study was conducted in the Department of Physiology, Mayo Institute of Medical Sciences, Barabanki (U.P.). Sixty asymptomatic healthy male subjects, aged 25-35 years, participated voluntarily in the present study undertaken, to the effect of alternate nostril breathing on cardiovascular parameters in obese young adults. Based on BMI subjects were divided in to two groups. Group -A comprised of non-obese subjects (BMI<25) and group -B comprised of obese subjects (BMI>30). Experiment procedures were in accordance with the ethical committee on human experimentation. Study was carried out at ambient temperature with minimal external or internal sound disturbances in the room. Subjects reported to laboratory 2 hours after light lunch. They were explained in detail about the experimental procedure. Informed consent was taken from all subjects. Subjects were asked to assume sitting posture. Systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) were recorded by using automatic digital sphygmomanometer. Then they practiced ANB for 15 min (acute exposure) as per instructions [8]:

1. Sit in a quiet place with the head, neck and trunk erect.

2. Fold the index and middle fingers of right hand in a way so that the right thumb can close the right nostril and the ring finger can close the left nostril (Vishnu Mudra).

3. Close the right nostril by the right thumb and exhale completely through the left nostril..

4. At the end of the exhalation close the left nostril with the ring finger, open the right nostril and inhale slowly and completely

5. Repeat this cycle of exhalation through the left nostril and inhalation through right nostril, exhale completely through the same nostril keeping

the left nostril closed with ring finger.

6. At the end of this exhalation close the right nostril and inhale through the left nostril and repeat this for two more times.

Inhalation and exhalation should be controlled and free from exertion and jerkiness in all the steps.

In summary, one exercise consisted of 3 cycles of exhalation through the left nostril and inhalation through the right nostril followed by 3 cycles of exhalation through the right nostril and inhalation through the left nostril and this was repeated for about 15 min.

All parameters were recorded again at the end of 15 minutes ANB exercise.

All data were collected and statistical analysis was done by paired t-test using the window SPSS Statistics 17.0 version.

FINDINGS

Table -1: Baseline characteristics of all subjects

S.N.		Group –A (Non-obese) (n=30)	Group –B (Obese) (n=30)
1	Age (in years)	31.4±5.2	31.2 ± 4.8
2	Height (cms)	168.5±6.2	168.12 ± 5.6
3	Weight (Kg)	65.5±5.3	86±5.2
4	BMI (kg/m^2)	23.2 ± 1.3	31.56±1.2

Table-2: Comparison of cardiovascular parameters before and after alternate nostril breathing (ANB) exercise

		Group –A (Non –obese)		Group –B (Obese)	
		Before ANB	After ANB	Before ANB	After ANB
1	Systolic blood pressure (SBP) (mm Hg)	115.2±1.4	107.4±1.2*	130.2±6.8	117.4±2.2**
2	Diastolic blood pressure (DBP) (mm Hg)	73.12±1.3	67.32±1.1*	82.15±4.6	75.62±6.2**
3	Heart rate (HR) (per minute)	72.38±0.7	68.4±0.7*	80.38±2.6	70.4±0.6**

*p<0.05 (significant), **p<0.0001(highly significant)

Data are expressed as Mean±SD.

Table -2 shows comparison of cardiovascular parameters before and after alternate nostril breathing in group -A (non obese) and group -B (obese). Systolic blood pressure (SBP), Diastolic blood pressure (DBP) and Heart rate (HR) decreased significantly after performing 15 minutes ANB in both the groups A &B. However decrease in all these parameters was more significant in obese subjects of group –B.

CONCLUSION

Obesity reduces the pulmonary as well as cardiac efficiency of subjects. Obesity is an important risk factor for development of hypertension. Sympathetic activity is more pronounced in obese individuals. This leads to increased blood pressure and heart rate in resting state in obese individuals. In addition, there is retention of fluid supported by increased sympathetic activity in obese persons which further tends to increase blood pressure. Alternate nostril breathing results in decrease in sympathetic activity and increase in parasympathetic activity. As a result of this decrease in sympathetic activity there is vasodilatation which causes decrease in peripheral resistance. It also decreases heart rate and myocardial contractility leading to decreased cardiac output. Decrease in cardiac output and peripheral resistance both results in decrease in systolic as well as diastolic blood pressure[12]. Alternate nostril breathing shifts the sympathovagal balance towards parasympathetic side. Therefore after performing alternate nostril breathing decrease in blood pressure and heart rate are more pronounced in obese individuals. The results suggest that alternate nostril breathing might be a great tool for prevention of hypertension in obese persons.

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Conflict of Interest: Nil

Source of Funding: Nil

Ethical Clearance: Procedures followed in the present study were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed concent was obtained from the subjects.

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Study of Stress in First Year Medical Students

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ABSTRACT

The stress is simply strains or tensions physical, mental, or emotional on a person or Stress is inappropriate response to emotional or physical threats it may be actual or imagined.[4, 5] Any environmental or personal events which lead to stress are named as stressors.[6]So stress is emotional disturbance or change caused by stressors. Objectives: To determine the prevalence of stress in first year medical students. To explore the sources of stress in these students. Materials and methods: A Cross sectional study using quantitative methodology was conducted among undergraduate first year M.B.B.S. medical students of Govt. Medical College, Miraj. The target population was undergraduate students of first years enrolled in 2013-2014 in Govt. Medical College, Miraj during the study period. Observations & results: Out of the 150 students, 144 students participated and completed the questionnaires in the given stipulated time, with a response rate of 96%. 67 students were females (46.53%) and 77 were males (53.47 %). The results shows that , ; 4 (2.78%) students having severe stress ; 139 (96.53%) mild to moderate stress; & 4 (2.78%) have no stress. : as per PSS, out of 144 students 1 (0.69%) have severe stress, 138 (95.83%) have mild to moderate stress & 5 (3.47%) have no stress. Conclusion: This study has found that majority of first year medical students experience stress.

Keywords: *- Stress factor, medical students*

INTRODUCTION

Recently stress among medical students is common compared to other professional courses.[1]The term 'stress' was first introduced by the endocrinologist Hans Selye in the 1930's. Stress is nonspecific response or reaction to demands made on it, or to disturbing events in the environment.[2, 3] The stress is simply strains or tensions either physical, mental, or emotional on a person or Stress is inappropriate response to emotional or physical threats it may be actual or imagined.[4, 5] Any environmental or personal events which lead to stress are named as stressors.[6]So stress is emotional disturbance or change caused by stressors.[7] Linn & Zeppa found that some stress is required in medical students for learning. Stress which promotes and facilitates learning is called 'favorable stresses and stress which inhibits and suppresses learning is called 'unfavorable stresses. For same stressors perception will be different by different medical students, depending on their cultural background, personal traits, experience and coping skills.

Some studies have been done in India found that there was high prevalence of stress in medical students, ranging from 30 -50 %.[8] Studies have revealed an association of unfavorable stress level with lowered medical students' self-esteem anxiety and depression difficulties in solving interpersonal conflicts sleeping disorders increased alcohol and drug consumption cynicism, decreased attention, reduced concentration and academic dishonesty Unfavorable stress was also associated with inhibition of students academic achievement and personal growth development.[9] As a result, medical students may feel inadequate and unsatisfied with their career as a medical practitioner in the future.[10]

Therefore it is very important to diagnose stressful students as early as possible & to give them effective psychological counseling, which can prevent possible future illnesses among medical students.

STRESSORS OF MEDICAL STUDENTS

In the present study, we aimed to determine the prevalence of stress, its sources & which stressor

is more stressful in first year M.B.B.S. medical students of Govt. medical college, Miraj. As health care professional it is our responsibility to know the prevalence of stress among medical students early in their training and to identify the relevant contributory factors. Understanding of these factors may help with planning measures to reduce perceived stress and burnout Stress among the students was analyzed using the questionnaires of Medical student's Stressor Questionnaire (MSSQ), Cohen's Perceived Stress Scaled (PSS-10).

OBJECTIVES

1. To determine the prevalence of stress in first year medical students.
2. To explore the sources of stress in these students.
3. To find out is there any association between gender and presence of stress

MATERIALS AND METHOD

Study Design: Cross sectional study

Setting & participants:- A Cross sectional study using quantitative methodology was conducted among undergraduate first year M.B.B.S. medical students of Govt. Medical College, Miraj. The target population was undergraduate students of first years enrolled in 2013-2014 in Govt. Medical College, Miraj during the study period. Taking into consideration the prevalence of anxiety and depression from various studies conducted previously at approximately 40%, the sample size has been calculated using the statistical formula 4pq/L2 (where allowable error has been assumed as 20%). Thus our sample size came as 150. Then Data collection spanned over the month of November 2013. Students were briefed about the purpose and objective of the study. Verbal consent was sought to participate in the study. The students were assured about anonymity and confidentiality of the responses given in the questionnaire and instructed to return the completed questionnaire. The questionnaire comprised of demographic data, the 10-item Cohen's Perceived Stress Scaled (PSS-10) a 26-item list of Medical student's Stressor Questionnaire (MSSQ),

Medical student's Stressor Questionnaire (MSSQ),

The data for present study was obtained through a special designed self – reporting questionnaire related to psychological stress. The potential stressors included in the questionnaire were derived by reviewing the literature and by holding informal discussion with a group of students. A total of 26 sources of stress were listed and grouped as academic, physical, social and interpersonal. For each potential stressor, the frequency of occurrence was classified as never, rarely, sometimes, often and always and scored as 1, 2, 3, 4 andn5 respectively. The severity of each stressor was rated using a Likert scale (1–10) ranging from not severe to very severe. The response 'never' had assigned a value of one and 'always' the highest score five. Score less than or equal to 3 is considered as no stressor and score greater than 3 is considered as a stressor for individual factor. (The total score for all the questions ranged between 1 and 130. A score less than 65 is no stressor experience, a score between 52 and 78 indicates mild to moderate stressor experience and a score between 79and 104 denotes severe stressor experience.) The questionnaire was then administered in 150 students and analyzed.

PERCEIVED STRESS

Perceived Stress Scale is the most widely cited psychological instrument used to measure an individual's level of perceived stress. Perceived stress was measured using the perceived stress scale (PSS-14), which comprised of 10 questions with responses varying from 0 to 4 for each item and ranging from never, almost never, sometimes, fairly often and very often respectively on the basis of their occurrence during one month prior to the survey. The PSS has an internal consistency of 0.85 (Cronbach a co-efficient) and test-retest reliability during a short retest interval (several days) of 0.85.[28] It assesses the degree to which participants evaluate their lives as being stressful during the past month. It does not tie appraisal to a particular situation; the scale is sensitive to the non occurrence of events as well as ongoing life circumstances. PSS-10 scores are obtained by reversing the scores on four positive items, for example 0 = 4, 1 = 3, 2 = 2, etc. and then summing across all 10 items. Items 4, 5, 6, 7 and 10 are the positively stated items. The scale yielded a single score with high scores indicating higher levels of stress and lower levels indicating lower levels of stress. The PSS-10 has a possible range of scores from 0 to 40. The range of PSS scores were also divided into stratified quartiles. The upper two and lower two

quartiles were combined (20 being the operational cut off value for the upper bound) and were labeled as stressed and not stressed respectively. This cut off value was selected in accordance to a similar study from Egypt. The stress score was stratified into no, mild, moderate (merged as low level) stress or severe (high level) stress according to first, second, and third, fourth quartiles.

OBSERVATIONS & RESULTS

Out of the 150 students, 144 students participated and completed the questionnaires in the given stipulated time, with a response rate of 96%. 67 students were females (46.53%) and 77 were males (53.47 %).

The most common source of stress identified in our study was academic & physical; the most common academic stressor was increased workloads towards exams, difficulty in covering portions daily, syllabus of first year M.B.B.S. was very vast

The information regarding the sources of stress as per MSSQ is summarized in the following table:

Stressors Category	Sr. No.	ITEM	Sometimes	Often /Always
academic factors	1	Difficulty in covering portions daily.	47 (32.64%)	93 (64.58%)
	2	Difficult to follow Guyton & Ganong.	58 (40.28%)	56 (38.89%)
	3	Not allowing other textbooks except Guyton & Ganong "is stressfull.	49 (34.03%)	27(18.75%)
	4	Fear of record book correction.	55 (38.19%)	37 (25.69%)
	5	Lack of time for drawing & writing record book after completing daily studies.	39(27.08%)	76 (52.78%)
	6	Tired after the tight schedule from 9a.m. to 5 p.m.	37 (25.69%)	69 (47.92%)
	7	Syllabus of first year MBBS is very vast.	42 (29.17%)	92 (63.89%)
	8	Topics are covered very fast.	57 (39.58%)	79 (54.86%)
	9	Less time for repeated learning.	51 (35.42%)	46 (31.94%)
	10	Increased workload towards exams.	29 (20.14%)	113 (78.47%)
	11	Stressful because of overlapping of part completion examinations by different departments.	42 (29.17%)	75 (52.08%)
	12	Physiology is very tough to understand.	71(49.32%)	16 (11.11%)
	13	Difficult to memorize topics.	82(56.94%)	50 (34.72%)
	14	Requiring more preparation compared to other colleagues'.	42 (29.17%)	94 (65.28%)
physical factors	15	Feel stressful because of hostel facilities provided by our college.	25(17.36%)	111 (77.08%)
	16	Feel stressful because of canteen, mess food provided by our college	20 (13.89%)	114 (79.17%)
	17	Feel stressful because of classroom facilities provided by our college.	58 (40.28%)	64(44.44%)
	18	Feel stressful because of different labs provided for practical by our college.	65 (45.14%)	42(29.17%)
	19	Feel stressful because of library facilities provided to you by our college.	45 (31.25%)	43 (29.86%)
social	20	Enjoyable while participating in different events, festivals, camps arranged & celebrated by our college.	18(12.50%)	117 (81.25%)
	21	Influenced by your parents.	51(35.42%)	57 (39.58%)
	22	Stressful because of economical constraints for medical education.	34(23.61%)	14 (9.72%)

interpersonal factors	23	Lack of time management skill.	42 (29.17%)	45 (31.25%)
	24	Habit of postponing routine work (procrastination).	67 (46.53%)	66(45.83%)
	25	Homesickness.	58 (40.28%)	48 (33.33%)
	26	more sensitive for above conditions compared to your colleagues	42 (29.17%)	30 (20.83%)

MSSQ: as per MSSQ; total no of students having severe stress 4 (2.78%); mild to moderate stress 139 (96.53%); & no stress 1 (0.69%)

Table 1: Distribution of stress as per MSSQ

	No. of students	%
Mild to moderate stress	139	96.53%
Severe stress	4	2.78%
No stress	1	0.69%

Gender wise difference in stress as per MSSQ: Out of 77 Males 76 (98.70%) have mild to moderate stress; not a single candidate with severe stress &. Out of 67 females 63 (94.03%) have mild to moderate stress, & 4 (5.97%) have severe stress.

Table 2: Gender wise distribution of stress as per MSSQ

	males	females
No stress	1 (1.30%)	0(0%)
Mild to Moderate stress	76 (98.70%)	63 (94.03%)
severe stress	0 (0%)	4 (5.97%)

Chi square test for association =4.52, p>0.05 (no significance)

PSS: as per PSS, out of 144 students 1 (0.69%) have severe stress, 138 (95.83%) have mild to moderate stress & 5 (3.47%) have no stress.

Table 3: Distribution of stress as per PSS

	No. of students	%
Severe stress	1	0.69
Mild to moderate stress	138	95.83
No stress	5	3.47

Gender wise distribution of PSS: Out of 77 males 73(94.81%) have mild to moderate stress, not a single male candidate have severe stress, 4(5.19%) have no stress, Out of 67 females, 1 (1.49%) has severe stress, 65(97.01%); & 1 female has no stress.

Table 4: Gender wise distribution of stress as per PSS

	No. of Males (%)	No. of Females (%)
Severe stress	0 (0.00%)	1(1.49%)
Mild to moderate stress	73 (94.81%)	65 (97.01%)
No stress	4 (5.19)	1 (5.19%)
Total	77 (53.47%)	67 (46.53%)

Chi square test for association =2.65 p>0.05 (not significant)

DISCUSSION

In our study we evaluated the prevalence of stress & explored the factors producing stress among first year MBBS students. The response rate of 96% renders an adequate sample for this study. The survey was carried out during the middle of the year to avoid the extreme or more than usual stress experienced by students during initial 3-4 months as they were newly admitted to medical college & last 3-4 months during final university examination preparation at the end of year.

The results as per MSSQ shows that , ; 4 (2.78%) students having severe stress ; 139 (96.53%) mild to moderate stress; & 4 (2.78%) have no stress. : as per PSS, out of 144 students 1 (0.69%) have severe stress, 138 (95.83%) have mild to moderate stress & 5 (3.47%) have no stress. This is comparable to study conducted by Dr. Sheela Sivan in the medical college Kerala, Sathidevi VK in medical college Kerala, Taranga Reang from Agartala Government Medical College & govind Ballabh Pant Hospital, Agartala, Tripura.[11, 12]

The study reveals that most common source of stress identified in our study was academic &

physical; the most common academic stressors were increased workloads towards exams, difficulty in covering portions daily , syllabus of first year M.B.B.S. was very vast required more preparation compared to other colleagues'. Topics are covered very fast. Lack of time for drawing & writing record book after completing daily studies.

Students in our college have to face physical stress regarding hostel facilities & food facilities because; this is the same year (2013) MCI given permission to increase strength of 100 students to 150 students. Our college is very old, started in year of 1962 with a batch of 30 students. So actually infrastructure is basically for 60 students later on with renovations as per availability of Government funds it is increased for 150 students but still some requirements are not fulfilled because of deficiency of funds. As this is a first batch of 150 students, following are the problems faced by student; 4 students to live in one room, they have to share tables cupboards, frequent blockage of toilets bathrooms. This is west Maharashtra area here all kinds of vegetables, fruits are available people from this area prefer little bit of spicy food is, so the students from out of Maharashtra doesn't prefer this kind of food especially north, south Indians, Guajarati students .

This study is not consistent with previous researches, assessed by GHQ & or PSS & or MSSQ Questionnaires in which a significant difference of stress, between males & females have been found. As per MSSQ & PSS the stress level between males & females is almost equal.

CONCLUSION

This study has found that majority of first year MBBS medical students experience stress. Major stressors are academic and physical factors Proper guidance & counseling by faculties, mental health workshop programmers, provision of recreation facilities, yoga, meditation by students, some changes in curriculum by university, infrastructure changes by higher authority may help to improve the present scenario.

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Ethical Clearance- Taken from govt. medical college, committee

Source of Funding- Self

Conflict of Interest – To find the stress in first year medical students

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Chronic Hyperglycemia and Inhomogenous Ventricular Repolarisation - an Electrophysiological Approach

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ABSTRACT

The QT interval expresses the myocardial depolarization and repolarisation time. QTd is regarded as an index of myocardial electrical activity. Present study was done to investigate the differences in QTd between non-diabetics, well controlled diabetes patients and poorly controlled diabetics. The study group comprised of 60 type 2 diabetes patients within the age group of 40-60 years coming to diabetic clinic and those hospitalized in medicine wards, They were further classified in to two sub-groups(n = 30 in each group), Type2 diabetes patients with good glycemic control (HbA1c < 7). And Type2 Diabetes patients with poor glycemic control (HbA1c > 7). Glycosylated hemoglobin level was detected by calorimetric method (spectronic -2).The control group consisted of 30 age matched healthy subjects (volunteers). After thorough examination of the subjects as per the proforma, 12 lead ECG was taken with (Montara instrument ELI 250), QT interval was measured on the 12 lead resting ECG. QTd was calculated manually. The value of QT dispersion was significantly high ($p < 0.01$) in Type2 Diabetes mellitus patients with poor glycemic control compared to well controlled diabetics and healthy subjects. Chronic hyperglycemia is associated with high QT dispersion which suggests that such patients have a greater inhomogeneity of repolarization and therefore they are more prone for adverse cardiovascular events.

Keywords: *Chronic Hyperglycemia, Inhomogenous Ventricular Repolarisation, QT dispersion.*

INTRODUCTION

Diabetes mellitus is characterized by chronic hyperglycemia with disturbance in carbohydrate, fat and protein metabolism due to defect in secretion of insulin, insulin action or both[1]. Depolarization and repolarisation time of the left ventricular myocardium is reflected by QT interval in ECG [2]. Previous studies have shown that patients with prolongation of the QT interval, either congenital or acquired are prone for sudden death due to malignant ventricular arrhythmias [3,4].QT dispersion (QTd), the difference between the greatest and smallest values of the QT interval on any of the twelve leads of the resting ECG, is an index of myocardial electrical activity [5,6].It is observed that the Q-T interval exhibits a certain degree of spatial variability on the epicardial surface [7] .This observation has led to the hypothesis that differences in the duration of the Q-T interval between ECG leads may reflect heterogeneity in recovery of excitability [8]. Studies have shown that inhomogenous ventricular repolarization provides a substrate for the development of malignant ventricular arrhythmias [9].These studies also conclude that variation in the duration of the Q-T interval has been advocated as a more predictive marker of arrhythmias and mortality than the absolute duration of the Q-T interval [6] .Variation in duration of the Q-T interval on the surface ECG in different leads is referred to as Q-T interval length dispersion or Q-T dispersion (QTd). It has been shown that the QTd is predictive of mortality in normal subjects and different groups of patients. Role of increased QTd has been described

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in patients with recent myocardial infarction [10], long Q-T syndrome [6, 11], heart failure [12] and hypertrophic cardiomyopathy [13]. QTd has also been studied in select groups of diabetic patients [14, 15] and reported to be a predictor of mortality in type 2 diabetic patients [16]. Present study is designed to compare differences in QT dispersion in poorly controlled diabetics, well controlled diabetics and healthy controls.

METHOD

The study comprised of 90 subjects, 60 type 2 diabetes patients and 30 age matched normal individuals. Type 2 diabetes patients were selected randomly from diabetic O.P.D. and those referred from medicine wards. Age and sex matched controls were volunteers. Type 2 diabetes patients were further classified in to two sub-groups - Type2 diabetes patients with good glycemic control (HbA1c < 7, n=30) and Type2 diabetes patients with poor glycemic control (HbA1c > 7, n=30). Informed consent was obtained from each subject. The study was approved by the ethical committee. Groups were selected by considering following inclusion and exclusion criteria.

Group D1: Type 2 Diabetes patients with poor glycemic control (n=30). The subjects in the age group of 40-60 years with HbA1c level greater than 7% were included. All the subjects were non smokers and non alcoholic. Subjects with any cardiovascular disease or those on drugs altering autonomic functions were excluded from the study.

Group D2: Type 2 Diabetes patients with good glycemic control (n=30). The subjects in the age group of 40-60 years with HbA1c level less than 7% were included. All the subjects were non smokers and non alcoholic. Subjects with any cardiovascular disease or those on drugs altering autonomic functions were excluded from the study.

Group D3: Healthy Controls (n=30). Non-diabetic matched subjects in the age group of 40-60 years were included. All the subjects were non smokers and non alcoholic. Subjects with any cardiovascular disease or those on drugs altering autonomic functions were excluded from the study.

Diagnosis of diabetes was done by following criteria.

Table 1: Criteria for the diagnosis of diabetes

A1C ≥ 6.5%. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.* or
FPG ≥ 126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least8 h.* or
2-h plasma glucose ≥ 200 mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by the World Health Organization, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.* or
In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥ 200 mg/dl (11.1 mmol/l)

*In the absence of unequivocal hyperglycemia, result should be confirmed by repeat testing.

The study was carried out in accordance with the Helsinki Declaration. All subjects participated voluntarily after being given a detailed explanation of the purpose of the study. All subjects of the study underwent a full clinical examination and history. The tests took place between 7-9 a.m. in an environment with stable temperature (22-24^{o}C). The subjects were instructed not to smoke, eat or drink coffee prior to examination. In the case of the diabetics, antidiabetic medication was given at the end of the examination.

12 lead ECG was taken in supine position (with Montara instrument ELI 250) with a paper speed of 25 mm/sec. QT interval was measured from the start of the QRS complex to the point where the T-wave intersected the isoelectric line in all 12 leads of each ECG. Difference between the longest (QTmax) and the shortest (QTmin) QT intervals within a 12-lead ECG was considered QT dispersion (QTd). QTd was calculated manually by single investigator, who was blinded with respect to the patient characteristics. When QT was not measurable in some of the leads in such cases QT interval was measured in at least 8 leads and QTd was estimated from these 8 leads [17]. When U waves were present nadir between T wave and U wave was considered end of QT segment. Heart rate corrected QT dispersion is not calculated because Malik and Camm have pointed out that there is no justification for using a corrected QT interval for the derivation of QT dispersion [18]. According to

many studies including Rotterdam study (n = 5812) QTd in normal individuals is ≤50 msec and ≥ 60 msec was considered abnormal. In this study least count being one smallest square on ECG i.e. 40 msec, values ≥ 80 msec was considered abnormal. Blood sample was collected and Glycosylated hemoglobin level was detected by calorimetric method (spectronic -2).

RESULT

There were three groups -

D1: Type2 Diabetes patients with poor glycemic control (n=30).

D2: Type2 Diabetes patients with good glycemic control (n=30).

D3: Control group (n=30).

The data collected were codified and entered into a computer for analysis by statistical software (SPSS). Mean and standard deviation were calculated and all three groups were compared with each other.

Table 2: Mean ± Standard Deviation.

Sr.no.	Groups	Mean ± S.D. HbA1c	Mean ± S.D. QT dispersion
1	D1	10.22 ± 1.55	78.66 ± 24.59
2	D2	6.34 ± 0.44	30.66 ± 17.20
3	D3	4.36 ± 0.52	25.33 ± 19.60

Comparison between Group D1 and Group D3:

QTd value was higher in group D1 (poorly controlled diabetes group) than group D3 (healthy controls) and the difference was statistically significant ($p<0.001$).

Comparison between Group D1 and Group D2:

QTd value was higher in group D1 (poorly controlled diabetes group) than group D2 (well controlled diabetes group) and the difference was statistically significant ($p<0.001$).

Comparison between Group D2 and Group D3:

With regards to QT dispersion, QTd value was almost the same in group D2 (well controlled diabetes group) and group D3 (healthy controls) and there was no significant difference between the two groups ($p = 0.27$).

Analysis also found that there is a significant positive correlation between HbA1c and QTd (Pearson's $r = 0.579$, $p<0.001$) i.e. as HbA1c increases, QTD also increases.

DISCUSSION

The pathophysiology underlying increased QTd is not fully understood, but is likely to be multifactorial.

Arrhythmogeneity depends partly on modulations of ion currents, partly on an abnormal ventricular structure and partly on the metabolism [19]. It reflects various subclinical disturbances, such as left ventricular hypertrophy, ischaemia and myocardial fibrosis. The severity of these lesions is positively correlated with an increase in QTd [20, 21]. In several studies in type 1 diabetes [22] and type 2 diabetes [23, 24]; QT abnormalities were not influenced by the level of metabolic control (HbA1C) or duration of diabetes. But these studies were of the view that a possible influence of hyperglycemia on QT abnormalities cannot be excluded and is worthy of further research. Present study shows that there is correlation between level of glucose control and QT dispersion. The probable reason for that could be mean and standard deviation of HbA1C in uncontrolled diabetic patient group in these studies were 7.7± 1.4 which in comparison to this study is much less (10.22 ± 1.55). Present study also shows that with increasing value of HbA1c, QTd also increases. These findings confirms the observation that the Q-T interval exhibits a certain degree of spatial variability on the epicardial surface in diabetic patients [7] leading to inhomogenous repolarization of ventricles making these patients more prone for adverse cardiovascular events. The mechanism by which hyperglycemia may produce ventricular instability may be increased sympathetic activity, increased cytosolic calcium content in myocytes, or both. By raising the production of free radicals, high glucose may reduce nitric oxide (NO) availability to target cells inducing a state of increased vasomotor tone and ventricular instability. Reduction of Na+/K+-ATPase activity, inhibition of Ca2+-ATPase activity, depressed Na+/Ca2+ exchanger activity, and activation of Na+/H+ antiport may all be implicated[25]. Brown et al [26] study has also concluded as per results from the Third National Health and Nutrition Examination Survey that diabetes was associated with an increased likelihood of prolonged QTc independent of age, race, gender, education, and heart rate. The greatest advantage of using the QT dispersion as a screening test is that it does not

require patient compliance, is non-invasive, easily obtained and cost effective. Increased QTd could be used as a cost effective marker to identify diabetic patients at high risk of cardiovascular morbidity and mortality and who therefore require more detailed cardiac investigations. Limitations of the present study include cross-sectional design and limited sample size. Larger studies are urgently needed to characterize in full the effect of hyperglycemia on heart tissue and its conducting system which may help a great deal to find therapeutic approaches that lessen the burden of cardiovascular morbidity and mortality in human diabetes.

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Effect of Advanced Uncomplicated Pregnancy on Pulmonary Function Parameters in a Tertiary Care Hospital

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ABSTRACT

The study was conducted on 50 normal pregnant women in third trimester of uncomplicated pregnancy (Test Group) and 50 age-matched non-pregnant women (Control Group) of identical socio economic background in the age group of 20-35 years in AGMC & GBP Hospital, Agartala, a tertiary care hospital in the North-Eastern India. Pulmonary function test parameters FVC, FEV1, FEF25-75%, PEFR & FEV1/FVC ratio were recorded by electronic Spirometer using Helios 401 software. There was a statistically significant decrease in all the pulmonary function test parameters in 3rd trimester of normal pregnancy when compared with the age-matched healthy non-pregnant control group. These changes in pulmonary functions are attributed to major adaptations in the maternal respiratory system and are also be influenced by the mechanical pressure of enlarging gravid uterus.

Keywords: *pregnancy; third trimester; pulmonary function tests; FVC; FEV_1; PEFR; FEF*

INTRODUCTION

The events in pregnancy elicit one of the best examples of selective anatomical, physiological and biochemical adaptations that occur during pregnancy and profound changes in respiratory physiology are a part of the same process[5].

Information regarding pulmonary functions in normal women during pregnancy is necessary for better antenatal care, and in assessment of fitness for anaesthesia and the progress of pre existing lung disease[1]. Pulmonary function tests (PFTs) permit an accurate and reproducible assessment of the functional state or respiratory system and allow quantification of the severity of disease[9]. The knowledge of the expected or desired changes in pulmonary function parameters is fundamental in understanding of how the disease states affect pregnancy & vice versa[8]. Besides understanding of the physiology of lung function during pregnancy will provide a control, on background of which, any respiratory problem that may appear during pregnancy can be evaluated with greater precision[2].

Although there are reports of changes in pulmonary function tests during pregnancy in Indian subjects, but in spite of our best effort hardly, any similar study could be found (which was carried out) specially in this part of the country. This study was undertaken to evaluate the pulmonary functions of women in the third trimester of uncomplicated pregnancy and to compare them with those of normal age matched non-pregnant women of identical socio economic background.

MATERIAL AND METHOD

This cross-sectional study was conducted in outpatient Department (OPD) of Obstetrics & Gynaecology, AGMC & GBP Hospital, Agartala in collaboration with Department of Physiology, AGMC, Agartala during two consecutive months (June & July) in 2014.

Inclusion criteria: Normal pregnant women of age groups 20-35 years (the study group) were selected randomly from antenatal OPD of Department of Obstetrics & Gynaecology, AGMC & GBP Hospital, Agartala. The age matched controls were randomly selected from the accompanying relatives of pregnant women attending OPD and from amongst hospital staff from same socioeconomic status.

Exclusion criteria: Subjects with acute respiratory infection, chronic respiratory infection

including bronchial asthma, history or clinical signs of cardiovascular diseases, diabetes mellitus, hypertension, sarcoidosis, tobacco consumption in any form, alcohol intake and other significant systemic disorders were excluded from the study. Those with multiple pregnancy, hydramnios or with any other pregnancy related complications were also excluded from the study.

Variables: Pulmonary function parameters were recorded by electronic Spirometer using Helios 401 software. The following parameters were recorded:

1. FVC (Forced vital capacity): The maximum volume of air expired after a maximum inspiration

2. FEV_1 (Forced expiratory volume in first second): The fraction of vital capacity expired during the first second of a forced expiration

3. $FEF_{25-75\%}$ (Forced expiratory flow 25-75%): Forced expiratory flow during 25-75% of expiration

4. PEFR (Peak expiratory flow rate): This is the expiratory flow rate during the peak of FVC

5. FEV_1/FVC ratio

Data sources/measurements: The pulmonary function parameters (FVC, FEV_1, $FEF_{25-75\%}$, PEFR & FEV_1/FVC ratio) were recorded by the following procedure. The subject was asked to relax for minimum 5 minutes before the test. All tests were conducted in a sitting posture at room temperature. The subject was asked to perform maximal inspiration followed by maximal expiration into the mouth-piece. Nostrils were closed by using nose clip during maximal expiration. For each test, three readings were taken. The highest reading of the three was taken for analysis.

Sample size: Study population was 50 normal pregnant women in 3rd trimester (>29 weeks of gestation) and 50 age-matched non-pregnant women as control group which was calculated by using conventional formula.

Statistical analysis: The data was statistically analyzed by using SPSS software (version: 15) for comparison between control and study groups. The results were expressed as Mean & SD. $P < 0.05$ was considered as statistically significant.

OBSERVATION AND RESULTS

Table 1: Pulmonary function parameters of study and control subjects

Parameters	Study Group (n=50)		Control Group (n=50)		p value
	mean±SD	SE	mean±SD	SE	
FVC (Lt./sec)	1.5098 ±0.53342	0.07544	1.8266 ±0 .45193	0.06391	0.002
FEV_1 (Lt./sec)	1.0304 ±0.46456	0.06570	1.6336 ± 0.49185	0.06956	0.000
FEV_1/FVC ratio	1.1948 ±0.62127	0.08786	2.2382 ±0.89416	0.12645	0.000
PEFR (Lt./sec)	1.5420 ±0.74738	0.10570	3.1434 ± 1.15329	0.16310	0.000
$FEF_{25-75\%}$ (Lt./sec)	72.0168±27.07246	3.82862	87.9188 ± 15.76114	2.22896	0.001

As viewed in Table 1, the mean FVC (Lt./sec) in study group was 1.51 and in the control group was 1.83. There was highly significant (P<0.01) decrease in the FVC in the third trimester of pregnancy (study group) in comparison with the non-pregnant women (control group). The mean FEV_1 (Lt./sec) in study group was 1.03 where as in the control group was 1.63. The decrease in FEV_1 in the study group was highly significant (P<0.001) in comparison to control group. The mean FEV_1/FVC ratio in the study group was 1.19 and in the control group was 2.24. The decrease in FEV_1/FVC ratio in the study group in comparison to control group was highly significant (P<0.001). The mean PEFR (Lt./sec) in study group was 1.54 where as in the control group was 3.14. The decrease in PEFR in the study group was highly significant (P<0.001) in comparison to control group. The mean $FEF_{25-75\%}$ (Lt./sec) in the study group was 72.02 where as in the control group it was 87.92. There was highly significant (P<0.01) decrease in $FEF_{25-75\%}$ in the study group when compared with the control group.

DISCUSSION

In the present study, the different pulmonary function test parameters (FVC, FEV_1, FEV_1/FVC ratio, PEFR & $FEF_{25-75\%}$) compared among the normal pregnant women at 3rd trimester of pregnancy (study group) and age-matched healthy non-pregnant women (control group)

[A] FVC: Neeraj et al.[5] observed the highly significant (P<0.01) decrease in mean FVC (% predicted) in the 3rd trimester of uncomplicated pregnancy in comparison to age-matched non-pregnant women. Anita Teli et al.[8] reported a statistically very highly significant decrease in FVC in 1st (P<0.001), 2nd (P<0.001) & 3rd (P<0.001) trimester of pregnancy when compared to healthy non-pregnant control group. Rupa Mokkapatti et al.[1] found a significant (P<0.05) decrease in FVC in 3rd trimester of normal pregnancy in comparison to non-pregnant control group. Lata Gupta et al.[9] observed a highly significant (P<0.001) decrease in FVC (Lt./sec) value in 3rd trimester of pregnancy when compared with the control group. Our findings in the present study are in consonance with other observers and this statistically significant decrease in FVC is attributable to the mechanical pressure of enlarging gravid uterus, elevating the diaphragm & restricting the movements of lungs thus hampering the forceful expiration[8].

[B] FEV_1: Neeraj et al.[5] recorded a highly significant (P<0.01) decrease in the mean FEV_1 (% predicted) in the 3rd trimester of uncomplicated pregnancy in comparison to non-pregnant group. Rupa Mokkapatti et al.[1] found a significant (P<0.05) decrease in FEV_1 in 3rd trimester of normal pregnancy in comparison to non-pregnant control group. Dalia Biswas et al.[10] reported a highly significant (P<0.001) decrease in FEV_1% in the 3rd trimester of pregnancy in comparison to non-pregnant control group. Lata Gupta et al.[9] observed a highly significant (P<0.001) fall in FEV_1 (Lt./sec) in 3rd trimester of pregnancy when compared with the non-pregnant control group. The statistically significant fall in FEV_1 in the present study is in agreement with the report of other workers and this may be due to significant restrictive defects produced by the enlarging uterus[10] and also may be due to decline in alveolar P_{CO2} (caused by hyperventilation) which acts as bronchoconstrictor during pregnancy[5].

[C] FEV_1/FVC ratio: Rupa Mokkapatti et al.[1] reported a significant (P<0.05) decrease in FEV_1/FVC ratio (% pred) in 3rd trimester of normal pregnancy in comparison to non-pregnant control group. Our study findings of statistically significant decrease in FEV_1/FVC ratio are agreed with the findings of Rupa Mokkapatti et al.[1] and it may be due to a significant decrease in both FEV_1 & FVC and more decrease in FEV_1 value which may be due to mechanical factor[1].

[D] PEFR: Neeraj et al.[5] established a highly significant (P<0.01) decrease in PEFR (% predicted) in the 3rd trimester of uncomplicated pregnancy in comparison to non-pregnant women. Anita Teli et al.[8] reported a statistically very highly significant decrease in PEFR in 1st (P<0.001), 2nd (P<0.001) & 3rd (P<0.001) trimester of pregnancy when compared to healthy non-pregnant control group. Mrunal S Phatak et al.[3] reported a highly significant (P<0.001) decline in PEFR throughout pregnancy. Hemant Deshpande et al.[11] studied a significant (P<0.05) decrease of PEFR and their percentage of predicted value during 3rd trimester of pregnancy compared to controls and there was a progressive decline from 1st to 3rd trimester. Dalia Biswas et al.[10] reported a significant (P<0.05) decrease in PEFR% in the 3rd trimester of pregnancy in comparison to non-pregnant control group. Our findings in this study regarding the statistically significant decrease in PEFR in the study group are in accordance with other workers' findings and this change in PEFR is may be due to a decline in alveolar P_{CO2} (caused by hyperventilation) which acts as broncho constrictor[5]. Also the decrease in PEFR could be due to lesser force of contraction of main expiratory muscles like the anterior abdominal wall muscles and internal intercostal muscles[3,5].

[E] $FEF_{25-75\%}$: Neeraj et al.[5] recorded a highly significant (P<0.01) decrease in mean $FEF_{25-75\%}$ (% predicted) in the 3rd trimester of uncomplicated pregnancy in comparison with the non-pregnant group. The statistically significant decrease in $FEF_{25-75\%}$ in the 3rd trimester of normal pregnancy in the present study are comparable to other workers' findings and this may be due to a decline in alveolar P_{CO2} (caused by hyperventilation) which acts as broncho constrictor[5].

In the present study it was observed that all the pulmonary function parameters (FVC, FEV_1, FEV_1/FVC ratio, PEFR & $FEF_{25-75\%}$) were decreased in the study group as compared to the control group. It was inferred that the respiratory parameters are

significantly compromised due to gravid state in the last trimester of pregnancy. The mechanical effects of gravid uterus cause relatively adaptive changes in pulmonary mechanics[9]. Though the pregnant women cause restrictive changes in the respiratory apparatus; the anatomical, physiological and hormonal changes compensate for them causing no discomfort to the pregnant women.

CONCLUSION

In the present study there was a statistically significant decrease in all the pulmonary function test parameters (FVC, FEV_1, FEV_1/FVC ratio, PEFR & $FEF_{25-75\%}$) in 3rd trimester of normal pregnancy when compared with the healthy non-pregnant women in the age group of 20-35 years. The results obtained are in consonance with the other Indian and foreign authors. This study gives an overall idea regarding the lung function tests in normal advanced pregnancy. This study will help in assessment of fitness for anaesthesia and the progress of pre-existing lung disease. However further and detailed study is needed in this regard.

Disclosure of Interests: We claim no potential conflicts of interest exist with any company/ organizations whose products or services may be discussed in this article. Furthermore, we claim no personal, political, intellectual or religious interests that conflict with our interests.

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Brainstem Auditory Evoked Potential Changes in Iron Deficient Anaemic Children

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ABSTRACT

Iron deficiency anaemia adversely affects different aspects of the nervous system such as myelinogenesis, neurotransmitters synthesis, brain myelin composition, and brain fatty acid and eicosanoid metabolism. This study was carried out to see the effect of Iron deficiency anaemia on brainstem auditory evoked potentials in children of age group 5-14 yrs because anaemia is a common problem in this age group too. Children were taken from Pediatrics OPD of Pt. B.D. Sharma PGIMS, Rohtak. They were divided into two groups first, controls (n=30) and anaemics (n=50).Anaemics were further divided in mild, moderate and severe anaemics. Only proven cases of anaemia were taken having Hb<12gm/dl. BAEP was recorded by using RMS EMG EPMK2 machine. Results showed that there was a statistically significant increase in absolute peak latencies of different waves but the Interpeak latencies and amplitudes were not significantly different between the two groups. To conclude we can say that, there should be an increased awareness in the medical fraternity and the population in general, of deleterious effects of iron deficiency, some of which are subtle and subclinical and will likely to have a long term effect.

Keywords: *BAEP, Iron deficiency anaemia, Interpeak latency*

INTRODUCTION

Anaemia is defined as a reduction in red cell mass or blood hemoglobin (Hb) concentration. Iron deficiency anaemia is the most common cause of nutritional anaemia in the world. An estimated 20% of world's population has iron deficiency anaemia.[1] In developing countries, iron deficiency anaemia is associated with low birth weight, malnutrition and unfavourable socio-economic conditions. Infants are at the greatest risk of iron deficiency anaemia because of rapid growth combined with inadequate diet. This risk also extends to pre-school and school children whose adverse living conditions and inadequate diet mean that iron deficiency is a common problem in this age group too.[2]

In the nervous system, iron has a major role in myelin formation besides its involvement in the synthesis and function of various neurotransmitters namely dopamine, serotonin, catecholamines and possibly Gamma amino butyric acid (GABA). There are data which indicate that iron uptake into the brain is maximal during the period of rapid brain growth which coincides with peak of myelinogenesis and that perinatal iron deficiency significantly alters myelination of spinal cord and white matter of cerebellar folds. However, iron uptake into brain continues throughout life. Oligodendrocytes participate in iron homeostasis through the synthesis and secretion of transferrin which is essential for their maturation and function. Conditions such as iron deficiency may reduce iron acquisition by oligodendrocytes and in this regard the observation that Iron deficient rats are hypomyelinated is highly relevant.[3]

Brainstem auditory evoked potentials (BAEP) are potentials recorded from scalp in response to a brief auditory stimulation to assess the conduction through auditory pathway upto midbrain. BAEP

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recording can represent an objective, clinically useful and non-invasive procedure to assess the early impairment of both auditory nerves and brainstem function.[4] Since myelination is concerned with the conduction in nerve fibers, the BAEP recordings have been used extensively to identify structural lesions associated with various demyelinating diseases.[5]We undertook the present study to see if there was any effect of iron deficiency in the BAEP recordings of anemic children.

MATERIAL AND METHOD

The present study was conducted in the Department of Physiology; Pt. B.D. Sharma PGIMS, Rohtak in 30 healthy children and 50 children of iron deficiency anaemia (hemoglobin <12gm%)[6] of either sex before the onset of puberty in age group between 5-12 years attending Pediatrics OPD of Pt. B.D. Sharma PGIMS, Rohtak. Only proven cases of iron deficiency anaemia in which diagnosis was made by history, clinical examination, and investigations like Hemoglobin and Peripheral blood film were included in the study.

Subjects with history of intake of ototoxic drugs, history of deafness or any other ear disease, any cardiovascular, respiratory, neurological disorders were excluded from the study.

RECORDING OF BAEPS

Recording was taken by using RMS EMG EPMK2 machine. Children were put at ease and were made to lie down, relaxed on a couch in a quiet room with low levels of electro acoustic interference. After thoroughly cleaning electrode recording sites on scalp with cleansing material (alcohol or spirit), electrolyte paste was applied on recording surface of disc electrodes and then Ag/AgCl electrodes were affixed at predetermined positions on scalp according to 10/20 international system of electrode placement.[7]Both ears were tested individually using shielded headphones.

Click stimuli having intensity of 70 dB above patients hearing threshold for each ear was used as a sound stimulus. White noise at 30 dB below intensity of stimulation click was used as a masking stimulus. A total of 2048 stimuli were given by passing 0.1 ms square pulses. Rate of stimulation was 10/sec.[3] Stimulus with alternating polarity were used. Absolute peak latencies of waves I, II, III, IV and V together with interpeak latencies of I-III, III-V and I-V and amplitude of wave I and V were recorded.

STATISTICAL ANALYSIS

All data were presented as mean±SD. The statistical significance of difference between groups was evaluated using student's t test. The level of significance was set at $p<0.05$.

RESULTS

Anaemic children were divided in 3 groups: mild anaemics((Hb:10-11.9gm%),moderate anaemics (Hb: 7-9.9 gm%) and severe anaemics (Hb<7 gm%).In Table I mean age, height, weight and hemoglobin of controls, mild anaemics, moderate anaemics and severe anaemics are shown.

Table I: Mean age, height, weight and hemoglobin of four groups. Data are expressed as Mean±SD.

Parameters	Controls (n=30)	Mild Anaemics (n=20)	Moderate Anaemics (n=20)	Severe Anaemics (n=10)
Age(yrs)	8.65±3.28	7.53±4.29	8.20±2.37	8.90±2.37
Height(cm)	118.82±4.54	117.72±3.65	126.10±12.84	130.60±12.85
Weight(kg)	21.06±2.25	20.74±3.21	25.37±6.81	26.80±6.72
Hemoglobin (gm%)	12.88±0.67	9.39±2.63***	8.72±0.75***	6.56±0.29***

Values are expressed as (mean±SD), ***p<0.001

Table II shows the BAEP parameters (latency, interpeak latency and amplitude) of left ear of different groups. A significant change ($p<0.05$) was observed in absolute peak latency of wave II in mild anaemics when compared with controls. The difference in absolute peak latencies of all the waves

was very highly significant (p<0.001) when moderate Anaemics were compared with controls. When severe anaemics were compared with controls the difference in absolute peak latency was significant (p<0.05) for wave IV, highly significant (p<0.01) for wave V, very highly significant (p<0.001) for wave I, II and wave III. Interpeak latency III-V showed a very highly significant change (p<0.001) when severe Anaemics were compared with controls.

Table II: BAEP Parameters (latency, interpeak latency and amplitude) of left ear of different groups

Parameters	Controls (n=30)	Mild Anaemics (n=20)	Moderate Anaemics (n=20)	Severe Anaemics (n=10)
Wave I(ms)	1.57±0.07	1.58±0.24	1.71±0.16***	1.90±0.26***
Wave II(ms)	2.62±0.07	2.73±0.25*	2.90±0.27***	2.85±0.28***
Wave III(ms)	3.70±0.11	3.71±0.16	3.90±0.26***	3.92±0.28***
Wave IV(ms)	4.77±0.15	4.83±0.37	5.10±0.37***	4.99±0.39*
Wave V(ms)	5.68±0.16	5.69±0.36	6.02±0.40***	5.91±0.35**
Interpeak latency I-III(ms)	2.14±0.18	2.01±0.34	2.20±0.18	2.23±0.32
Interpeak latency III-V(ms)	2.00±0.08	2.07±0.37	2.05±0.56	2.25±0.31***
Interpeak latency I-V(ms)	4.14±0.22	4.10±0.51	4.31±0.53	4.23±0.15
Amplitude I-Ia(μv)	0.30±0.06	0.35±0.31	0.34±0.37	0.34±0.28
AmplitudeV-Va(μv)	0.36±0.12	0.38±0.15	0.61±0.85	0.46±0.35

Values are expressed as (mean±SD),*p<0.05, **p<0.01, ***p<0.001

Table III shows the BAEP parameters (latency, interpeak latency and amplitude) of right ear of different groups. The difference in absolute peak latency of wave II was significant (p<0.05) and for wave III it was highly significant (p<0.01) when mild Anaemics were compared with controls. When moderate Anaemics were compared with controls, the difference was significant (p<0.05) for wave III, highly significant (p<0.01) for wave I. The difference in absolute peak latency was significant (p<0.05) for wave V and highly significant (p<0.01) for wave III when severe anaemics were compared with controls.

Table III: BAEP Parameters (latency, interpeak latency and amplitude) of Right ear of different groups

Parameters	Controls (n=30)	Mild Anaemics (n=20)	Moderate Anaemics (n=20)	Severe Anaemics (n=10)
Wave I(ms)	1.43±0.15	1.53±0.24	1.56±0.12**	1.60±0.29
Wave II(ms)	2.49±0.11	2.64±0.29*	2.58±0.25	2.68±0.35
Wave III(ms)	3.37±0.24	3.61±0.30**	3.57±0.28*	3.67±0.38**
Wave IV(ms)	4.65±0.22	4.78±0.42	4.80±0.43	4.68±0.31
Wave V(ms)	5.57±0.36	5.66±0.34	5.77±0.44	5.90±0.42*
Interpeak latency I-III(ms)	2.09±0.14	2.08±0.34	2.09±0.21	2.17±0.49
Interpeak latency III-V(ms)	1.98±0.39	2.05±0.41	2.12±0.40	2.14±0.46
Interpeak latency I-V(ms)	4.11±0.33	4.12±0.36	4.21±0.47	4.36±0.46
Amplitude I-Ia(μv)	0.31±0.04	0.25±0.23	0.40±0.60	0.54±0.96
Amplitude V-Va(μv)	0.33±0.14	0.37±0.18	0.43±0.45	0.28±0.13

Values are expressed as (mean±SD),*p<0.05, **p<0.01, ***p<0.001

DISCUSSION

Iron deficiency is the most commonly recognized form of nutritional deficiency in developing as well as in affluent societies. It is particularly prevalent among infants and young children because rapid growth imposes large iron needs and most of the infants diet contain a marginal supply of iron.[8]Majority of iron, in the normal brain is related to oligodendrocytes where it is directly involved in myelin production as a co-factor for cholesterol and lipid biosynthesis and indirectly because of its requirement for oxidative metabolism. Hypomyelination has been reported in iron deficiency states.[9]

Iron is essential not only for myelination but also for the synthesis of various mitochondrial enzymes , neurotransmitters etc. Studies document the alteration of dopaminergic functioning in iron deficiency.[10] However , we didn't explore the status of iron containing enzymes and the neurotransmitters in our study because of non availability of such facilities.

Various diagnostic tools are used to detect hearing impairment like BAEP and audiometry. BAEP is a neurophysiologic diagnostic tool which can detect hearing impairment precisely and accurately.[5] BAEP has been used extensively to identify subclinical lesions associated with various pathological disorders including demyelinating diseases .[11]

The pattern of findings in our study, with differences in latencies but not in amplitudes support the hypomyelination hypothesis. It is generally accepted that latency changes relate to increase in conduction velocity during axonal myelination.[12-14]However modifications in amplitude and duration are probably the result of improvement in synchronization at the axonal or synaptic levels. [15] However, we emphasize that this study did not directly demonstrate delayed myelination.

Other relevant human studies of iron deficiency anaemia (IDA) are scarce and provide little comparable information. Roncagliolo et al (1998) found that the central conduction time (CCT) or wave I-V interpeak latency was longer in those who had been anaemic. The pattern of results like differences in latencies but not amplitudes ,more effect on late ABR(auditory brainstem responses) components(waves III and V), and longer CCTs, suggested altered myelination.[16]

Shankar et al observed that the absolute peak latencies of the waves (I to V) were more in case of anaemic children, though the value was significantly different from controls only in case of wave IV. The interpeak latencies and the amplitudes were not significantly different between the two groups even though the anaemic group showed increased latencies and lower amplitudes as compared to the controls.[3] In contrast, our study showed significant changes in almost all the waves and significant changes in interpeak latency III-V in case of severe anaemics. This difference could be because of children were more severely anaemic in our study group.

Nawal et al compared 30 iron deficient children aged 2-5 yrs with matched controls and found that ABR latencies and interpeak latencies were significantly prolonged and amplitudes significantly lower in children with Iron deficiency anaemia.[17]In our study also we observed similar increase in latencies.

A study carried out on 33 Turkish infants and children with Iron deficiency anaemia and 31 healthy controls were compared in three age groups: 0-12 months, 13-36 months and 37-60 months. Significant differences in different waves of ABR were found in all the three iron deficient groups compared to control group ($p<0.05$, $p<0.005$and $p<0.05$, respectively).[18]

Rocinholi et al determined the effects of an iron-deficient diet and of handling on the BAEP of rats during development. Iron deficiency increased the latencies of BAEP waves, suggesting damage to the myelin layer, especially during the early development, and the effects of handling were more evident along time in anaemic animals.[19]

However, a study conducted by Sarici et al didn't show any statistically significant difference between the BAEP of the anaemic group and the control group. They carried out a follow up study after 3 months of oral iron therapy to the anaemic, but the BAEP of anaemic group performed before and after 3 months of oral iron therapy didn't show any significant difference. [20]Kurekci et al found similar results. The only positive finding they determined in their study was a slight decrease in latencies obtained at the end of the study when compared to the pre-study values. [21]

A study carried out by Algarin et al, investigated

long term effects of iron deficiency anaemia in infancy on auditory function .They found significant increase in absolute latencies (except I-III interpeak latency) in former iron-deficient infants as compared to the children who were non-anaemic in infancy.[22]Similar changes were also observed in our study.

A definite correlation is also seen between the severity of anaemia and the degree of neurophysiologic deficits. Li et al demonstrated abnormal brainstem auditory evoked potential results in 26 of 48 iron deficient infants. The presence of peripheral type of hearing impairment was emphasized, especially in high frequencies, and a direct relationship between severity of iron-deficiency anaemia and degree of abnormality of BAEP was demonstrated. The most significant abnormality were increase in the latencies of waves I and II and in wave I-V interpeak latency.[23]Such correlation was also observed in the present study.

Thus, iron deficiency could interfere directly with neurotransmission in the auditory pathway or indirectly by altering certain processes that modulate brainstem auditory activity. In our study, we found significant changes in latencies but not in amplitudes seem to fit best with a direct effect on neurotransmission through an alteration in myelination.

CONCLUSION

To conclude we can say that, there should be an increased awareness in the medical fraternity and the population in general, of deleterious effects of iron deficiency, some of which are subtle and subclinical and will likely to have a long term effect.

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Determination of F Wave Index in Healthy Adult Males

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ABSTRACT

Background: Each skeletal muscle is supplied by two or more nerve roots and if one nerve root is affected and the other is spared then the clinically used F wave minimum latency can still be normal. So, in the present study an F wave Index was constructed by taking into consideration the other parameters of F wave like persistence, chronodispersion, latency and arm length to help in the early diagnosis of peripheral neuropathy.

Aim : The primary purpose of this study was to provide normative electrophysiological data for F wave Index in the upper limb median nerve(Abductor Pollicis Brevis) in healthy male volunteers.

Materials and Method: This was a cross sectional study carried out on 40 healthy adult males between 30 to 50 years of age. The F wave recording was done using a digitalized nerve conduction/EMG/EP machine in a quiet and dimly lit electrophysiological laboratory. All recordings were done between 9 and 11am maintaining an ambient temperature of 22^0 C. The F wave recording was obtained from a fully relaxed muscle by stimulating the median nerve using the standard procedure. The F wave Index was calculated for median nerve of both upper limbs. **Result:** The F wave index was calculated for median nerve. The absolute mean values of F wave Index between right and left arms were different but the difference was not statistically significant (p= 0.16).

Conclusion: The F wave Index of the right and the left median nerves were determined.

Key words: *F wave Index, median nerve, upper limb*

INTRODUCTION

F wave is a late response that follows the motor response (M) and it is elicited by a supra maximal electrical stimulation of a mixed or a motor nerve.The term "F wave" is so called because of its recognition for the first time in the small muscles of the foot by Magladery and McDougal in 1950.[1] The afferent and efferent pathway for the F wave is the alpha motor neuron. It is the most commonly used diagnostically valuable late response used in the early diagnosis of proximal nerve lesions, polyneuropathy, radiculopathy diabetic peripheral neuropathy and Guillain Barre Syndrome(GBS).[2] It can be recorded from most limb and facial muscles.

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F WAVE INDEX

The F wave minimum latency is the parameter that is normally used to arrive at a clinical diagnosis of proximal nerve lesions.

Each skeletal muscle is usually supplied by two or more nerve roots. So if one root is affected and the other is spared, the F wave minimum latency might still be normal. We feel that the construction of an F wave index by taking into consideration all the F wave parameters would be more accurate in diagnosing cases of peripheral neuropathy. F wave is,

- directly proportional to persistence

- inversely proportional to chronodispersion
- inversely proportional to latency corrected for arm length

These relationships can be mathematically represented as the 'F' wave index,

F Index = (Persistence x Armlength) / (Latency x Chronodispersion)

PARAMETERS OF F WAVE

1. Latency: Latency is the time period between the point of stimulation and the occurrence of F wave. The minimal F wave latency of the median nerve in the upper limb is 34.4ms in males and 31ms in females. Right to left asymmetry exceeding 2ms is considered abnormal.

2.Chronodispersion: It is the difference between the maximal and minimal latencies. It is highly sensitive for diagnosing demyelinating neuropathy.

3. Persistence: This indicates the percentage of discernible responses obtained (>200micro volt) after a series of stimuli. It is calculated by dividing the number of F responses by the number of stimuli. Persistence shows variation depending on the muscle i.e. highest for flexors of arm and extensors of legs.[3]

MATERIAL AND METHOD

The study was carried out after obtaining ethical clearance from the Institute's ethical committee. A written informed consent was also taken from the participants who were enrolled in the study. The study was carried out over a period of one year from January 2012 to January 2013 in the Department of Physiology at Pondicherry Institute of Medical Sciences, Puducherry. Standard laboratory temperature of 22^0 C was maintained. A digitalized nerve conduction/EMG/EP machine (Recorders Medicare Systems,Chandigarh,India) was used for the study procedure.

Method: This was a cross sectional study carried out among 40 healthy volunteers between the age group of 30 to 50 years. A questionnaire which included Toronto Clinical Scoring system was used to determine that the subject was healthy and did not have symptoms of peripheral neuropathy. Also those subjects who had any history of Diabetes mellitus, carpal tunnel syndrome, GBS, myopathy, hypothyroid, neuromuscular injury / disorders, fracture of upper limb bones and subjects with pacemakers were excluded from the study.

The F wave was recorded from the median nerve (APB muscle) of both upper limbs using the routinely used clinical procedure.[4,5,6]

STATISTICAL ANALYSIS

The datas were checked for completeness. Data analysis was done using Statistical Package of Social Sciences (SPSS) version 16.0. Descriptive Statistics: Mean, Standard Deviation, Median, IQR of F wave Index were tabulated. Mann-Whitney U test was used to compare the mean score of F wave index between right and left arm of healthy volunteers.

RESULTS

The age and height of the study subjects are presented in table 1. The median values with interquartile range (IQR) of the F wave Index are presented in table 2.

Table 1: Demographic details of study subjects(n = 40)

Parameters	Mean	Standard Deviation
Age(years)	40.40	6.58
Height(cm)	165.75	5.68

Table 2: Comparison of F wave Index between the right and left upper limb (APB) of healthy volunteers

	Right arm	Left arm
Median value	102.62	77.43
IQR		
25	68.23	56.28
75	151.83	114.30
Mann Whitney U test	p= 0.16	

DISCUSSION

The F wave study is one of the most frequently

used simple and non- invasive techniques used for assessing peripheral neuropathy. Of all the F wave parameters, the F wave minimum latency is most commonly used to diagnose peripheral neuropathy. Various studies suggest that one cannot arrive at the diagnosis of peripheral neuropathy by just considering a single parameter. Hence our study aimed at constructing an F wave Index by including other parameters of the F wave which could increase the sensitivity of the investigation while used in diagnosis of neuropathy. We noticed in the present study that the F wave Index in the study group was 102.62 in the right arm and 77.43 in the left arm and this is in accordance with the side to side difference seen in nerve conduction parameters. Literature search revealed a few studies which have considered the inclusion of chronodispersion and F wave mean latency and its diagnosing ability. However, there are very few studies that recommend variations in the standardisation of F wave methodology.

A few studies support the additional use of F wave chronodispersion in detecting neuropathy and spinal cord injury.[2,7]

Panayiotopoulos et al proposed the use of F wave chronodispersion and tacheodispersion for early diagnosis of minimal nerve lesions.[8]

A study by Vuolgaris et al showed that F wave persistence was a better indicator than F wave minimum latency in diagnosing radiculopathy.[9] Uludag et al in their study concluded that F-jitter had better sensitivity than rest of the F wave parameters in diagnosing polyneuropathy, and have recommended its inclusion in F wave studies for diagnosis of peripheral neuropathy.[10]

LIMITATIONS OF THE STUDY

The normal value for F Index was derived from 40 normal subjects. The skewed data from our study could be due to our small sample size. So, we suggest that calculation of F Index should be carried out among larger population. Our present study in patients(unpublished data) suggests that the F wave Index is significantly different from that of normal subjects and can be used for the early diagnosis of neuropathy.

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Assessment of Coagulation Profile and its Correlation with Severity of Preeclampsia in Women of Odisha

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ABSTRACT

Background: Preeclampsia is an idiopathic multisystem disorder. It is associated with alteration of haematological profile of which thrombocytopenia is the most common which may be accompanied by a clinically evident consumptive coagulopathy or may be the sole abnormality seen.

Objective: The aim of the study is to compare the coagulation parameters in the patients with preeclampsia and normal pregnant women

Material and method The study comprised of 100 pregnant women with preeclampsia in age group 18-45years. 100 healthy age matched pregnant women served as controls. Coagulation parameters done were total platelet count (TPC), prothrombin time (PT) activated partial thromboplastin time (aPTT), bleeding time (BT), coagulation time (CT)

The parameters were compared by using Student's t-test and Pearson correlation.

Result: In preeclamptic women, mean age group is 25.52 ± 4.38 years. A significant decline in platelet count ($p<0.001$), increase in PT ($p<0.05$), aPTT ($p<0.001$), BT (<0.001) and CT ($p<0.05$) was seen in preeclampsia as compared to normal pregnancy. With severe fall in platelet count in preeclamptic subjects prolongation of aPTT is more pronounced than PT.

Conclusion: it is concluded from the study that total platelet count estimation can be taken as an early and rapid procedure for screening preeclampsia cases at admission followed by serial platelet counts while monitoring intrapartum coagulation indices.

Keywords: *thrombocytopenia, preeclampsia, coagulation, bleeding time, prothrombin time*

INTRODUCTION

Preeclampsia, the most common of hypertensive disorders of pregnancy is an idiopathic multisystem disorder affecting 2 – 10% of all pregnancies.[1, 2]

It is the major cause of maternal mortality and substantial cause of neonatal morbidity and mortality. Due to low socioeconomic status, apathetic attitude, poor health education and lack of regular antenatal supervision the incidence of preeclampsia is more in developing countries like India.[3]

According to the criteria of the International Society of the Study of Hypertension in

Pregnancy, the preferred definition is a diagnosis of pregnancy-induced hypertension (diastolic blood pressure _90 mm Hg) occurring after week 20 of gestation with proteinuria (either _300 mg protein per day or an urinary protein/creatinine ratio _30 mg/mmol).[4]

The basic pathology of preeclampsia is endothelial dysfunction, poor placentation and vasospasm of vessels along with alteration of haematological profile

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of which thrombocytopenia is the most common. [5, 6]

Thrombocytopenia may be accompanied by a clinically evident consumptive coagulopathy or may be the sole abnormality seen. The present study is designed to compare the coagulation parameters in patients with preeclampsia and normal pregnant women and to determine the relationship between total platelet count and severity of preeclampsia along with changes in coagulation parameters.

MATERIAL AND METHOD

The present cross-sectional study was carried out in the Department of Physiology, along with collaboration of Department of Obstetrics and Gynaecology, Department of Haematology and Department of Biochemistry of S.C.B. Medical College, Cuttack from the period of March 2013 to June 2014.

The study includes 100 preeclampsia patients from the outdoor, indoor and labour room of Department of Obstetrics and Gynaecology and 100 normal pregnant women within age group of 18-35 years. The healthy pregnant women were selected from antenatal outdoor of Obstetrics and Gynaecology department of S.C.B. Medical College and Hospital, Cuttack at random. It was believed that, in the healthy individuals, the socio economic strata of the community had been adequately represented.

EXCLUSION CRITERIA

Women with previous history of hypertension, diabetes mellitus, history of recurrent miscarriages, previous hepatic or renal disease, multiple foetuses, idiopathic thrombocytopenic purpura (ITP) or any other bleeding diathesis, immunosuppressant or history of illicit drug use were excluded from the study

The preeclamptic women were selected based on the following criteria:

Pregnant women with blood pressure over the baseline ≥ 140 /90 mm of Hg with proteinuria ≥ 0.3 gm / l or >1 + measured by dipstick.

Cases were categorized into Mild (140-159 /90-109 mm Hg) and severe (≥160 /110) on the basis of blood pressure based upon classification of American College of Obstetrician & Gynaecologist (ACOG).

After taking informed written consent from each subject and approval of institution ethical committee, detailed history was recorded regarding gravida, parity, history of diabetes mellitus, hypertension and other obstetrics and gynaecological complications. Ultrasonography was done in all cases to confirm the gestational age and to exclude any obstetrical and gynaecological complications

Complete clinical examination was done at the start of experiment. The anthropometric parameters like height and weight of subject were measured. Blood pressure was measured with patients in supine position and resting comfortably on her right hand at 30 degrees to the horizontal with the sphygmomanometer cuff at the level of the heart.

Experimentation and collection of data: Blood was collected from all the enrolled patients who were not given any therapy for preeclampsia for the assessment of coagulation profile

Coagulation Parameters done are –

- Total Platelet count (TPC) – Direct method using Rees-Eckert fluid.
- Prothrombin Time (PT) – Automated coagulation analyzer – Thromborel S. reagent.
- Activated partial thromboplastin time (aPTT) – Automated coagulation analyzer – Dade Action FSL activated PTT analyzer.
- Bleeding time (BT) – Duke's Method.
- Coagulation time (CT) – Capillary tube method of Wright.

Statistical analysis of data: All data were expressed as Mean $\pm$ SD. Statistical analysis was done using unpaired students t test, Pearson correlation coefficient. A level of p value <0.05 was used to indicate statistical significance in all analyses. Data was analysed using SPSS version 19.

RESULTS

Figure1 shows the mean age distribution in the study population. In normal pregnancy the mean age is 24.72 ± 3.53 years and in preeclampsia, mean age group is 25.52 ± 4.38 years, with a maximum number of cases in the age group of 24-29 years.

Figure 2 shows that maximum women in this

study are in the gestational age group of 33-40 weeks, 88% cases in normal pregnancy and 80% cases in preeclampsia with mean gestational age of 36.08±3.12 weeks and 36.1±3.61 weeks respectively

Figure 3 shows, out of 100 cases of preeclampsia, 42 cases have mild preeclampsia and 58cases with severe preeclampsia.

Table – 1 shows coagulation parameters in normal pregnancy and preeclampsia women. The mean total platelet count in normal pregnancy is 2.41 ± 0.450 lacs/mm^3 and in preeclampsia 1.23±0.416 lacs/ mm^3.There is statistically significant increase in PT ($p<0.05$), aPTT ($p<0.001$), BT (<0.001) and CT ($p<0.05$) in preeclampsia as compared to normal pregnancy.

Figure 4 shows distribution of cases based on severity of preeclampsia and estimated platelet count. In the study group, 13(26%)cases have platelet count below 1 lac/mm3, out of which 2(4%)cases have mild preeclampsia and 11(22%)cases are of severe preeclampsia. 25(50%)cases have platelet count between 1 lac – 1.5 lacs /mm3. Platelet count above 1.5 lacs /mm3 is found in only 12(24%) cases; 7(14%) cases having mild preeclampsia and 5(10%) cases severe preeclampsia.

Table 2 shows severe preeclampsia is present in 4% cases at 29-32 weeks of gestation and increases to 18% at 33 – 40 weeks of gestation with platelet count <1 lac /mm^3.

Figure 5 shows the coagulation abnormalities in subjects depending on platelet count. Out of 13 cases having platelet count below 1 lac/mm^3, 4(30.7%) cases have prolonged PT and 7(53.8%) cases with prolonged aPTT. It is evidenced from the table that in cases with severe fall in platelet count prolongation of aPTT is more pronounced than PT.

DISCUSSION

The findings of the present study confirm that preeclampsia is more prevalent in primigravida and most of the cases presented for treatment at an advanced stage of disease. Younger age of occurrence of preeclampsia in this study testifies the early age of marriage and pregnancy in this country compared to western countries. In this study both the normal pregnant women serving as control and preeclampsia patients are in the same gestational age group. Similar findings were documented in various studies.[7-9]

The present study documents significant reduction of platelet count, prolongation of bleeding time ($p<0.001$), prothrombin time ($p<0.05$) and activated partial thromboplastin time ($p<0.001$) in preeclampsia as compared to normal pregnancy. Similar findings were documented in various studies. The low platelet level was attributed to immunologically mediated destruction, platelet aggregation and consumption whereas prolonged BT & PTT and increased level of fibrin degradation products (FDP) were due to reduced synthesis of coagulation factors due to liver dysfunction.[10-13]

Thrombocytopenia is reported frequently in severe preeclampsia which has also been reported in various studies. There is progressive fall of mean platelet count with the increasing severity of disease.[14, 15]

In the present study ,severe preeclampsia is present in 4% cases at 29-32 weeks of gestation and increases to 18% at 33 – 40 weeks of gestation with platelet count <1 lac /mm^3 which is attributed to increased platelet activation, enhanced aggregation, destruction which appear to be due to endothelial damage.[16,17]

Platelet activation may lead to increased generation of thromboxane A_2 and serotonin release, in turn increase vasoconstriction and platelet aggregation.

In the present study we documented increased prolongation of aPTT when total platelet count is very low (<1lac/mm^3) Similar findings were documented by several studies. Leduce et al and S. Mohapatra et al in their study claimed that no subject had an abnormal prolonged PT or aPTT in the absence of thrombocytopenia.[14, 18]

Jambhulkar S et al documented that platelet count and partial thromboplastin time have predictive value in detecting disseminated intravascular coagulation (DIC) in preeclampsia and these parameters show more abnormal results with increasing severity of preeclampsia. Bleeding time, coagulation time & prothrombin time were normal but partial thromboplastin time was significantly prolonged. [19]

However, Prieto JA et al observed that there was no correlation between the level of thrombocytopenia and the levels of PT & PTT.[20]

Jahromi N et al stated in their study that the mean value of platelet count was lower (p<0.001) and the mean value of aPTT was higher (p<0.05) in preeclamptic patients. However, the mean value of PT showed no statistical difference between two groups (p>0.05).There was significant correlation between thrombocytopenia and prolonged aPTT which led to conclusion that the measurements of aPTT seems to be important for early diagnosis of coagulation abnormalities in patients with severe preeclampsia who have normal platelet count.[21]

Similar to the present study, Mc Donagh RJ et al documented platelet count to be very specific for predicting a prolonged bleeding time. There was a significant negative correlation between TPC and BT (r = -0.45, 95% CI – 0.26 to 0.60 P <0.0001.).[22]

However, Rodgers RPC et al suggested that earlier bleeding time was used to assess platelet count in pregnancy with thrombocytopenia but now it is rarely used because of its disadvantages i.e. it is invasive, unreliable, highly operator dependent and is also insensitive, especially to mild platelet defects and not a good predictor of bleeding risk. [23]

So, it is concluded from the study that total platelet count estimation can be taken as an early and rapid procedure for screening preeclampsia cases at admission followed by serial platelet counts while monitoring intrapartum coagulation indices. Evaluation of PT and aPTT should be kept reserved and added only if the platelet count falls below 1 lac/ mm^3.An ongoing coagulopathy should be suspected if thrombocytopenia along with prolongation of PT and aPTT is found and the treatment should be started at the earliest.

However, more research is required in this field to find an ideal screening method for early identification of preeclampsia and prediction of its severity. This would open up new possibilities for early diagnosis and effective management of preeclampsia cases.

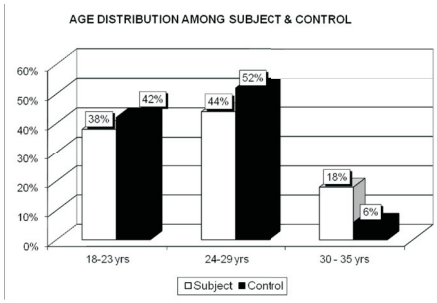

Figure 1

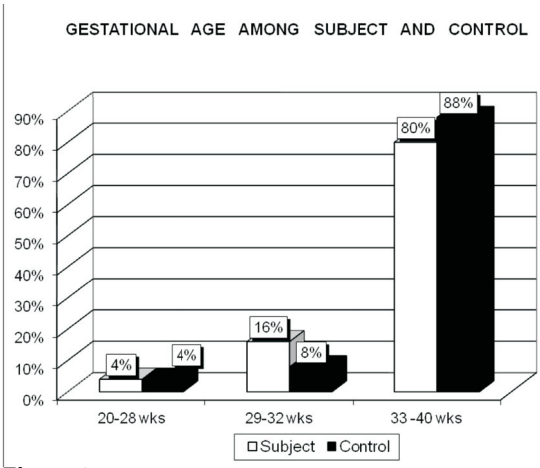

Figure 2

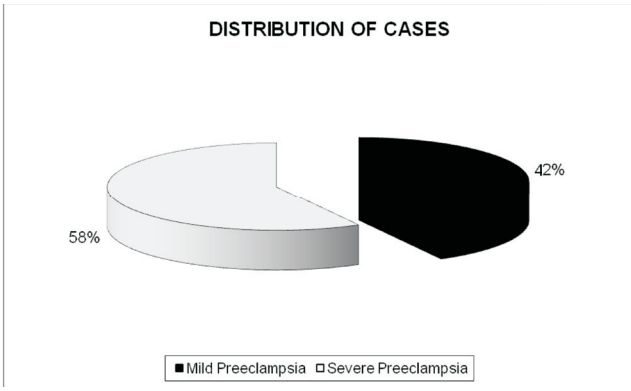

Figure 3

TABLE – 1

Abnormalities of coagulation tests in preeclampsia compared with normal pregnancy

Parameters	Preeclampsia	Normal Pregnancy	P. Value
TPC	1.23 ± 0.416	2.41 ± 0.450	< 0.001
PT	15.27 ± 3.47	13.72 ± 1.97	<0.05
aPTT	34.20 ± 11.46	22.16 ± 4.70	<0.001
BT	5.03 ± 1.52	3.65 ± 0.9	<0.001
CT	4.81±1.19	4.37±0.85	<0.05

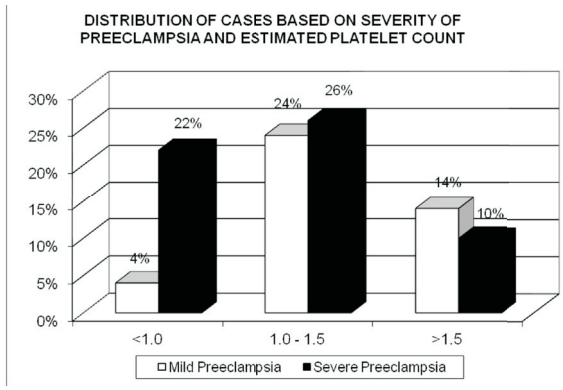

Figure 4

TABLE – 2

Distribution of cases in relation to total platelet count and severity of preeclampsia

G.Age (in weeks)	Cases	TPC (in lacs/mm^3)		
		<1 No. of Cases	1-1.5 No. of Cases	>1.5 No. of cases
20-28	Mild		1 (2%)	
	Severe			1 (2%)
29-32	Mild		2 (4%)	2 (4%)
	Severe	2 (4%)	2 (4%)	
33-40	Mild	2 (4%)	9 (18%)	5 (10%)
	Severe	9 (18%)	11 (22%)	4 (8%)

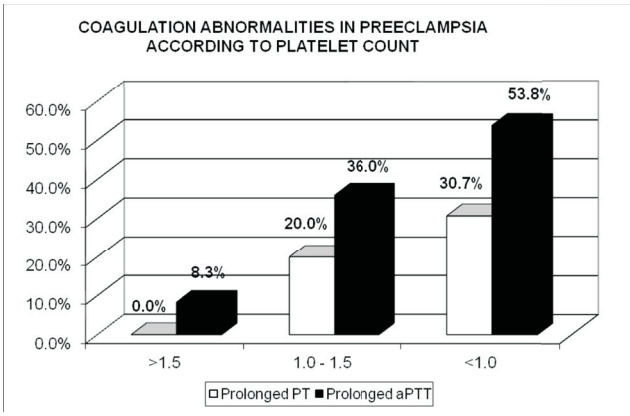

Figure 5

Limitations & future scope of the study: Sample size is less. Broad spectrum, multicentric studies are strongly recommended

Competing Interests: Authors don't have any competing interest.

Authors' Contribution: Girija Priyadarshini and Rama Raman Mohanty designed the study, performed the experiment, interpreted the data, drafted the manuscript and revised it. Final manuscript was approved by all authors.

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Evalution of Autonomic Status in Thyroid Dysfunction by Heart Rate Variability

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ABSTRACT

Background & Objectives: - Changes in the thyroid status has pronounced effects on cardiovascular system which reflect autonomic dysfunction. This may contribute to morbidity in thyroid patients. Exact nature of interaction between autonomic nervous activity & thyroid hormones is controversial. It is also unknown whether the extent of autonomic dysfunction is related with the severity of the thyroid disease. Hence the autonomic status in thyroid patients was assessed and compared with healthy age matched (18-45 yrs) controls. **Design of study: -** Prospective case control. **Methods: -** Depending on clinical examination and serum levels of T_3, T_4 & TSH; three groups were categorized as hypothyroid, euthyroid and hyperthyroid. Autonomic functions based on heart rate responses to various maneuvers were evaluated in thyroid patients & compared with euthyroid (control) group. For the assessment of heart rate variability by thyroid status, Autonomic Function Tests (AFTs), like Resting heart rate, 30:15 ratio, Standing to lying ratio (SLR) tests were recorded on ECG in Lead II. Statistical analysis was done using student's *t*-test to compare between controls and thyroid patients. **Results: -** AFTs like 30:15 ratio, SLR declined significantly both in hypothyroid and hyperthyroid patients as compared to euthyroid subjects (p-value< 0.01).

Interpretation & Conclusion: - Hyperthyroidism leads to low excitability of cardiac vagal motor neurons, reducing parasympathetic activity and hence heart rate variability response is depressed. At the same time direct action of thyroid hormone on SA node and myocardium has additive effect to sympathetic system resulting in hyperadrenergic state. Hypothyroidism decreases direct action of thyroid hormones on the heart, which is compensated by increasing basal sympathetic tone and influencing resting heart rate. Also there is impaired response to Beta receptors, so there is over activity of Alpha receptors in hypothyroidism. This exhibits blunted sympatho-excitatory responses further reducing vagal tone and decreasing heart rate variability response.

Keywords: *Autonomic Function Tests (AFTs), Resting heart rate, Hypothyroidism, Hyperthyroidism, 30:15 ratio Standing to lying ratio (SLR)*

INTRODUCTION

Thyroid hormone acts upon almost every organ and system of body. Changes in thyroid status are associated with changes not only in cardiac and vascular functions but also in autonomic regulation of cardiovascular system[1, 2]. But a great deal of uncertainty persists regarding the exact interaction between autonomic functions and thyroid hormones in controlling the various organ systems[3]. This motivated us to study the alterations in autonomic functions that accompany thyroid disease by assessing the heart rate variability.

The clinical picture of hyperthyroidism suggests increase in sympathetic activity but the plasma norepinephrine levels are normal or decreased. Hypothyroidism shows reduced sympathetic activity[1].

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But the plasma norepinephrine levels are increased[4]. Hence to study the cardiac vagal excitability & adrenergic activity, AFTs like Resting heart rate, 30:15 ratio & standing to lying ratio (SLR) based on cardiovascular reflexes were done by standard methods to assess the heart rate variability in hyperthyroid and hypothyroid patients and compared with euthyroid subjects.

Evaluation of effect of thyroid state on cardiovascular system will serve as an important step in the management of thyroid disease.

AIMS AND OBJECTIVES

1) To evaluate the autonomic status in adult hyperthyroid and hypothyroid patients using standard autonomic functions tests for heart rate variability.

2) To evaluate efficacy of standard autonomic function tests in euthyroid adults, hyperthyroid and hypothyroid patients by assessing heart rate variability.

3) To study the correlation between thyroid status and the autonomic functions regulating cardiovascular system.

MATERIAL AND METHOD

Clinically diagnosed and untreated 30 hyperthyroid and 30 hypothyroid patients were assessed and compared with 30 euthyroid adults with AFTs based on cardiovascular system. All the patients and controls were taken from Dr Milind Patwardhan's Endocrine Research Center, Miraj. Permission was taken from the Head of the center. Consent for experimentation was obtained from all patients and healthy controls. Patients suffering from others conditions known to affect AFTs were excluded from the study e.g. Diabetes mellitus, Coronary heart disease, Electrolyte imbalance, Leprosy, Anemia, Pregnancy etc. Based on hormonal assays they were categorized as hyper, hypo and euthyroid.

The following parameters were studied 1) Resting heart rate, 2) Lying to standing maneuver (30:15 ratio) &

3) Standing to lying maneuver (SLR).

PROCEDURES

1) Resting heart rate: - Subject was asked to take rest in supine position for 15 minutes. After fixing leads, the subject was asked to lie quietly for 3 minutes. After that heart rate was recorded by taking ECG in lead II for full 1 minute. Distance between two consecutive R waves was counted in millimeters (mm). The speed of ECG paper used was 25 mm / sec. Therefore heart rate counted by using formula— Heart rate = 1500 / Distance between 2 consecutive R waves in mm.

2) 30:15 ratio (Lying to standing maneuver or initial heart rate response to standing or immediate heart rate response to standing):- In this test, each subject was asked to lie down quietly for 3 minutes, then stand up unaided, while continuous ECG was being recorded. About 30 beats were recorded in lying position, while standing and after standing about 60 beats were recorded. The time of standing was noted and marked in the record. In euthyroid subjects, after standing, there is immediate shortening of R – R interval which is maximum around 15th beat after standing followed by relative lengthening of R – R interval around 30th beat after standing[5].

The ratio was calculated as:-

30:15 ratio= Longest R–R interval at around 30th beat after standing / Shortest R -R interval at around 15th beat after standing.

Normal range of the ratio is > 1.04.

3) Standing to lying ratio:- The test was done as follows–Subject was made to stand quietly for 2 minutes and then lie down quickly without any support while continuous ECG was recorded i.e. from 20 beats before to 60 beats after lying down. The point at which the posture changed from standing to lying was marked. The SLR was calculated as –

Longest R –R interval during 5 beats before lying down / Shortest R –R interval during 10 beats after lying down.

The normal range of the ratio is > 1.04.

Statistical analysis comprised comparison, using unpaired Students *t*-test of autonomic function tests between the different groups.

RESULTS

TABLE NO.1: Resting heart rate, 30:15 ratio & S/L ratio in hypothyroid, euthyroid and hyperthyroid groups (mean values)

	Hypothyroid	Euthyroid	Hyperthyroid
Mean Heart Rate (beats/min)	68.801	82.29	97.54
S.D.	±8.47	±8.51	±12.6
Mean (30:15) Ratio	1.033	1.169	1.041
S.D.	±0.01013	±0.094	±0.052
Mean SLR	1.014	1.083	1.006
S.D.	±.012	±0.059	±0.087

TABLE NO.2: Comparison of mean values of Resting Heart Rate, 30:15 Ratio & S/L Ratio of euthyroid with hypothyroid and hyperthyroid groups

	Resting Heart Rate		30:15 Ratio		S/L Ratio	
	Hypo thyroid	Hyper thyroid	Hypo thyroid	Hyper thyroid	Hypo thyroid	Hyper thyroid
Diff. In Means	13.48	15.25	0.136	0.128	0.069	0.077
T-value	6.15	5.4	5.39	6.43	2.83	4
P-value	P < .01	P < .01	P<.01	P<.01	P < .01	P < .01
Results	Highly Significant	Highly Significant	Highly Significant	Highly Significant	Highly Significant	Highly Significant

Resting heart rate: - The mean value of resting heart rate in controls is 82.29/min ± 8.51 and in hypothyroid declined to 68.801/min ± 8.47 (table no.1). This difference between the mean values is found to be statistically highly significant ($p<0.01$) (Table 1& 2). The mean value of resting heart rate in euthyroid subjects is 82.29/min ± 8.51 and in hyperthyroid it increased to 97.54/min ± 12.6. This difference is statistically highly significant ($p<0.01$) (Table 1& 2).

30:15 Ratio:- The mean values of 30:15 ratio in euthyroid subjects is 1.169 ± 0.09 and in hypothyroid it is declined to 1.033 ± 0.01 (Table 1 & 2). The difference between the mean values is found to be statistically highly significant ($p<0.05$). The mean values of 30: 15 ratio in euthyroid subjects is 1.169 ± 0.09 and in hyperthyroidism it is declined to 1.04 ± 0.05 (Table 1). The difference is statistically highly significant ($p<0.05$).

SLR: - The mean value of SLR in control subjects is 1.083 ± 0.059 and in hypothyroid patients it declined to 1.014 ± 0.12. The difference in means is statistically highly significant ($p<0.01$) (Table 1& 2). The mean value of SLR in control subjects is 1.083 ± 0.059 and in hyperthyroid patients it declined to 1.006 ± 0.087 (Table 1& 2).

The difference is statistically highly significant ($p<0.01$).

DISCUSSION

AFTs were performed to assess the integrity of the sympathetic and parasympathetic system in thyroid patients and compared with euthyroid subjects. The resting heart rate was declined significantly in hypothyroid patients as compared to euthyroids. The probable explanation is thyroid status alters the balance of sympathetic to parasympathetic tone in the heart. Hypothyroidism alters the relative contribution of systems that maintain resting blood pressure and heart rate with predominant sympathetic influence at

rest which compensated for the lower intrinsic heart rate[1]. Also there is decrease in the direct chronotropic effect of thyroid hormone on SA node by significant reductions in the transcription of pacemaker channels and decrease in vagal activity in hypothyroids compared to euthyroids[6, 7].

In hyperthyroidism, the resting heart rate increased significantly than that of euthyroid subjects. The probable reason is direct action of thyroid hormone on SA node which results in increased chronotropic effect[1]. In addition T_4 modulates rate of transcription of multiple genes which increases synthesis of transport proteins[6]. Increased T_3 & T_4 leads to unbalanced sympathovagal tone i.e. decreased vagal tone & normal or reduced sympathetic tone[2, 3]. Also the effects of thyroxin and catecholamines are additive[8]. Our finding is similar to study done by M. Shurvy et al in hyperthyroid subjects[9].

30:15 ratio significantly declined in hypothyroid patients probable cause is increased basal sympathetic tone to compensate for thyroid hormone deficiency and reduces reflex activation of sympathetic system during stress and exercise[1]. This further result in hypofunctioning of parasympathetic tone[6, 10]. So R-R interval shortening at 15th beat & elongation at 30th beat (R-R interval variation) is reduced.

30:15 ratio significantly declined in hyperthyroid patients probable reason is excess of thyroid hormone decreased the vagal tone which further decreased the R-R interval variation or the heart rate variability[1, 11].

SLR significantly declined in hypothyroid patients as compared to euthyroid subjects. The reason is increased basal sympathetic tone to compensate for thyroid hormone deficiency. This further result in hypofunctioning of parasympathetic tone. So there is reduced change in heart rate variability[10].

SLR significantly declined in hyperthyroid patients as the cardiac vagal motor neurons are in low excitable state. So vagal tonic discharge is not increased in lying down position. So reduced heart rate variability[11, 12, 13, 14].

Hypothyroidism or hyperthyroidism account for some of the change in autonomic outflow at rest and for altered regulation of autonomic functions in response to various stresses[15]. Our study shows similar findings done with spectral analysis by A. Mahajan et al, where they have found primarily sympathetic function abnormality along with selective parasympathetic dysfunction in hypothyroid patients[16].

Studies have shown that timely treatment can achieve reversal of autonomic abnormalities, decreasing the morbidity of thyroid patients[12, 17, 18, 19, 20].

CONCLUSION

AFTs were deranged in both hypothyroid and hyperthyroid patients. In hypothyroidism, basal sympathetic activity is increased leading to secondary hypo functioning of parasympathetic activity. So heart rate variability response is decreased in hypothyroid patients. In hyperthyroid patients, there is reduction in vagal activity. Sympathetic activity though appears to be enhanced; it is normal or sometimes decreased. Extent of autonomic dysfunction does not show significant correlation with the severity of disease. Hence more the number of abnormal AFTs more is the autonomic dysfunction. AFTs 30:15 ratio & SLR which are highly sensitive may help to detect thyroid disease in the early stages, management of thyroid disease, dose adjustment of thyroid patients and evaluation of effectiveness of thyroid surgery.

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A Comparative Study of Sensory and Motor Nerve Conduction Velocity in Prediabetes and Diabetes

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ABSTRACT

Diabetic neuropathy is a very common clinical problem and troublesome complication of diabetes mellitus. The prevalence of peripheral neuropathy is rising with the global burden of diabetes mellitus. Prediabetes is increasingly being viewed as an important contributor to neuropathy. Neuropathy can be assessed electrophysiologically. Monitoring of the nerve conduction velocity is a sensitive method for detection of neuropathies. In this study we try to look for changes in nerve conduction velocity in prediabetes and diabetes. A total of 120 subjects were categorized as: Group I: 40 subjects with normal glucose level, Group II: 40 prediabetes and Group III: 40 diabetic subjects. Nerve conduction study was done on these subjects using RMS EMG EP MARK-11 equipment which works on Windows XP with Microsoft Office 2007.The nerve conduction velocity of Peroneal and Sural nerve were measured. The data obtained from this study showed that the conduction velocity of peroneal nerve in prediabetes was decreased when compared with controls and the sural nerve conduction velocity was significantly decreased in prediabetes (p value of 0.047) and diabetes (p value of <0.001) when compared with the controls indicating early onset of neuropathy even in prediabetes. Nerve conduction studies should be of value to determine neuropathy in prediabetes. This study supported the idea that prediabetes is a transitional state before diabetes and also the importance of the nerve conduction for early detection of neuropathy.

Keywords: *Nerve conduction study, Prediabetes, Nerve conduction velocity, Diabetic neuropathy*

INTRODUCTION

Diabetes is a condition primarily defined by the level of hyperglycaemia giving rise to risk of microvascular damage (retinopathy, nephropathy and neuropathy). It is associated with reduced life expectancy, significant morbidity due to specific diabetes related microvascular complications, increased risk of macrovascular complications (ischaemic heart disease, stroke and peripheral vascular disease), and diminished quality of life.[1]A study done in 2011 projected that India would be 62.4 million people with diabetes and 77.2 million people with prediabetes.[2]

India is today a global hub of diabetes with an overwhelming estimated population of 61.3 million suffering from it.[3]Diabetes mellitus is one of the main causes of peripheral neuropathy. Traditionally neuropathy has been considered a chronic complications that occurs only after long term diabetes mellitus, but evidence now indicates that neuropathic complications arise atleast as early as the time of diagnosis of diabetes mellitus.[4]

India accounts for 23.5 per cent of the world's disability adjusted life years (DALYs) lost due to diabetes 2.[5] Prevalence of Diabetic peripheral neuropathy in Type 2 diabetic subjects in an Indian study was shown to be 26.1%.[6]

Prediabetes (intermediate hyperglycemia), typically defined as blood glucose concentrations higher than normal, but lower than diabetes thresholds, is a high risk state for diabetes development. Prevalence of diabetes and prediabetes is increasing worldwide and experts have projected that more than 366 million people will have diabetes and 470 million people will have prediabetes by 2030.[7,8]

Long standing hygerglycemia is responsible for increased activation of the polyol pathway and increased production of advanced glycation end products which promotes oxidative stress. Impaired blood flow to the nerves, leading to hypoxia and reduced production of nerve growth factor perpetuates neuronal damage.[4]

Two population-based studies have assessed the prevalence of neuropathy in prediabetes and the results are remarkably similar, with neuropathy present in 11–13% of prediabetes and 26–28% of diabetic subjects.[9]

Neuropathy occurring in prediabetes and early diabetes are phenotypically very similar, suggesting a continuum of glucose dysregulation in which some individuals are more sensitive to early distal neuropathic injury than others. [10]

Nerve conduction studies, primarily nerve conduction velocities are considered one of the most sensitive indices of the severity of neuropathy.[11] Abnormal glucose levels result in different types of nerve derangements including axonal injury or demyelination.[12] The neuropathy whether demyelinating or axonal can be determined on the basis of nerve conduction studies.[13]The neuropathy associated with prediabetes is clinically similar to early diabetic neuropathy. Prediabetic and diabetic neuropathy patients share abnormal microvascular endothelial dysfunction.[14]

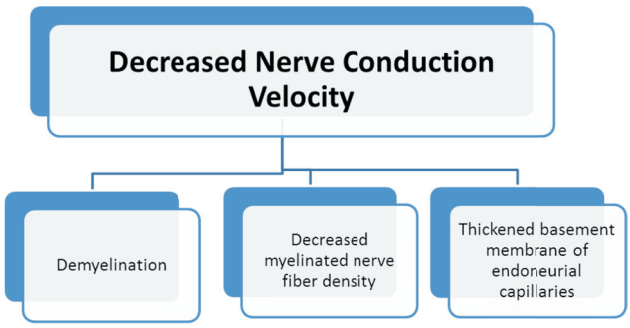

Figure 1: Causes of decreased nerve conduction velocity

The prevention of diabetes and its complications are a far better strategy than dealing with its advanced complications. There is very little research on the prevalence of diabetes related complication in pre-diabetes patients and there are not many studies from India which looked into the prevalence of nerve conduction abnormalities in prediabetes. Therefore in this study we aim to study the nerve conduction velocity of motor and sensory nerve in prediabetes and diabetes mellitus.

AIMS AND OBJECTIVES

To compare the nerve conduction velocity of motor and sensory nerve in prediabetes and diabetes

MATERIAL AND METHOD

The study was carried out during a period of one year (January 2013 to December 2013). It was a cross sectional study which was conducted in VIMS & RC hospital. Subjects were taken from outpatient department of endocrinology and age matched healthy controls were recruited for the study from master health check up. Nerve conduction study was conducted in the department of Neurology. 120 subjects were taken for the study and grouped into three groups according to WHO guidelines of diabetes diagnosis as group I- controls, group II- prediabetes and group III- diabetes. An ethical clearance and an informed consent from the study subjects were duly obtained.

Inclusion criteria

- The participants were male subjects in the age group of 40 to 70 years
- Prediabetes and diabetes mellitus subjects were place according to the WHO guidelines.
- Age matched control subjects were recruited for the study.

Exclusion criteria

- Subjects with history of HIV, regular alcohol consumption, liver diseases, hypertension, thyroid disorders, rheumatoid arthritis and neurological disorders in consultation with the neurologist were excluded.
- Subjects with permanent pacemaker or other implanted stimulators such as deep brain stimulators or spinal cord stimulators were excluded from the study

Nerve conduction was done for the entire study group. Peroneal nerve was taken for motor nerve and sural nerve was taken for sensory nerve.RMS EMG EP machine was used to do nerve conduction studies. Analysis of variance (ANOVA) has been used to find

the significance of study parameters between three or more groups of patients. Post-Hoc Tukey test has been done to find the pairwise significance.

RESULTS

Age distribution of diabetic men was 52.31±8.55, prediabetes was 52.24±6.80 and non-diabetic was 52.81±8.85. It was statistically similar in all the groups with p value of 0.940. Table 1 shows the demographic profile of the study groups

Table 1: Comparison of variables in three groups studied

	GroupI CONTROLS	GroupII PREDIABETES	Group III DIABETES	P value
Age (years)	52.81±8.85	52.24±6.80	52.31±8.55	0.940
Weight (kg)	65.14±6.70	65.02±7.99	61.67±8.44	0.069+
Height (cm)	165.76±5.11	163.64±4.73	163.60±4.07	0.055+
BMI (kg/m^2)	23.76±2.74	24.35±3.41	23.10±3.49	0.210
Waist circumference (cm)	86.50±6.01	88.50±5.27	88.45±6.95	0.236
Hip circumference (cm)	92.90±6.56	97.33±6.90	96.33±9.64	0.027*
Fasting Blood Sugar(mg/dl)	87.00±7.52	109.31±10.69	174.69±57.23	<0.001**
Post Prandial Blood Sugar(mg/dl)	108.71±13.71	173.62±18.18	281.31±84.70	<0.001**
Glycosylated haemoglobin (%)	4.99±0.40	6.15±0.50	11.74±2.30	<0.001**

Table 2 shows the comparison of motor and sensory nerve conduction velocity.The conduction velocity of peroneal nerve in prediabetes and diabetes were decreased in comparison with the control group. The conduction velocity of sural nerve in prediabetes and diabetes were significantly decreased in comparison with the control group with a p value of 0.047 and 0.001 respectively

Table 2: Comparison of motor and sensory nerve conduction velocity

Nerve	Mean ±SD			Pair wise significance		
	Group I CONTROLS	Group II PREDIABETES	Group III DIABETES	GroupI Group II	Group I-Group III	Group II-Group III
• Peroneal	50.87±5.25	49.91±62.03	43.54±8.00	0.625	0.992	0.701
• Sural	47.80±6.84	44.14±6.60	40.14±7.59	0.047*	<0.001**	0.027*

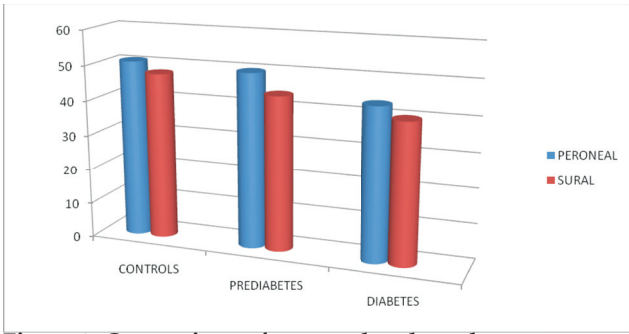

Figure 2: Comparison of peroneal and sural nerve conduction velocity in three groups studied

DISCUSSION

Most recognized neurologic complications associated with diabetes involve the peripheral nervous system. The diabetic neuropathies include several distinctive clinical syndromes with differing clinical manifestations, anatomic distributions, clinical courses, and possibly underlying pathophysiologies.

Peripheral nerve involvement is highly frequent in diabetes mellitus and it has been documented

that one third of diabetic patients have peripheral neuropathy.[15]

The true prevalence is not known and reports vary from 10% to 90% in diabetic patients depending on the criteria and methods used to define neuropathy.[16]

Prediabetes is associated with the simultaneous presence of insulin resistance and beta cell dysfunction abnormalities that start before glucose changes are detectable.[7] Prediabetic neuropathy and early diabetic peripheral neuropathy are clinically similar, characterized by preferential injury to small nerve fibers which is usually accompanied by sensory symptoms and disabling pain .[17,18]

The nature of the relationship between prediabetes and neuropathy is not clear, although microangiopathy, episodic postprandial hyperglycemia, and endothelial dysfunction.[14] may be causal factors. No large well-designed studies of the prevalence and long-term prognosis of prediabetic neuropathy have been conducted. However, several studies have demonstrated a high prevalence of prediabetes in individuals with idiopathic peripheral neuropathy (45%) [19], suggesting that the disease may represent the earliest stage of diabetic nerve injury

The conduction velocity of prediabetes was slower when compared with the controls in both motor and sensory nerves but the sensory conduction velocity of sural nerve was significantly decreased when compared with the control. Sensory nerves are more affected in diabetes than motor nerves. This is an agreement with the study done by Thrainsdottir et al [20]. This study supported the idea that even in Prediabetes the pathophysiological changes of neuropathy has begun .The presence of abnormal nerve conduction velocity in patients with prediabetes found in this study needs to be confirmed by a prospective long-term study involving a larger group of subjects.

CONCLUSION

The data obtained from the present study showed decreased nerve conduction velocity indicating early onset of neuropathy in diabetic group as well as in prediabetes. Sensory nerve is more affected than motor nerve. This study supported the idea that prediabetes is a transitional state before diabetes and also the importance of the nerve conduction velocity for early detection of neuropathy.

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CONFLICT OF INTEREST

The authors declared that they don't have any conflict of interest.

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Effect of Rajayoga Meditation on Blood Pressure, Heart Rate, Cardiac Output, Cardiac Index, Peripheral Blood Flow (Right Upper Limb & Lower Limb)

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ABSTRACT

Background: Rajayoga Meditation is good for maintaining proper health of an individual reduces Blood Pressure and stress, producing consistent physiological changes and have sound scientific basis. It also improves the cardiovascular parameters.

Aims & Objectives: To find the effect of short and long term 'Rajayoga Meditation' practice on different parameters of Blood Pressure(BP),Heart Rate (HR),Cardiac Output(CO),Cardiac Index(CI),Peripheral Blood Flow(PBF) in right upper limbs and right lower limbs.

Material & Method: This is a cross-sectional study conducted, on 54 individual of age group(18-40yrs.) of both sexes. Each individual was informed about the purpose and benefits of the study and written consent was taken before examination.

Procedure: The subjects were divided into three groups on the basis of time period ,they have been practicing 'Rajayoga Meditation'.

- Group-A consists of 14 meditators practicing 'Rajayoga Meditation' for 2-5yrs.
- Group-B consists of 15 meditators practicing 'Rajayoga Meditation' for >10yrs.
- Group-C consists of 25 non-meditators as control.

The various parameters were recorded in a calm and silent environment in each individual. The Heart Rate , Cardiac Output , Cardiac Index , Peripheral Blood Flow(Right Upper & Lower Limbs) were recorded by NICOMON(L&T,Mysore).

Result: This study quantifies the effects of Rajayoga Meditation on the pratitioners of 2-5years and >10years compared to the non-pratitioners and gives the significant changes which are lower in meditators as to the non-meditators.

Conclusion: 'Rajayoga Meditation' shows a significant changes after practiced for a certain time period by an individual.

A. In comparison of Group-A to Group-C have shown significant changes in BP,HR,CO,CI,PBF.

B. In comparison of Group-B to Group-C BP, HR and PBF(Right upper and lower limb) was found to be significantly lower in rajayoga meditators than non-meditators, while CO and CI have insignificant changes.

C. On comparison of meditator practicing 'Rajayoga mediation' for 2-5yrs & >10yrs were found significant changes in Systolic and diastolic blood pressure.

Keywords: *'Rajayoga Meditation' , Blood Pressure , Heart Rate , Cardiac Output , Cardiac Index , PBF(Right upper and Lower Limbs)*

INTRODUCTION

Meditation is a complex phenomenon that involves several coordinated, effects on human body. (1) Meditation has entered the main stream of health care as a method of stress and pain reduction. In the recent years there has been a growing interest within the medical community to study the physiological effects of meditation (2-5).

Raja Yoga meditation as taught in the Brahmakumaris World Spiritual University (also known as Prajapita Brahmakumaris Ishwariya Vishwa Vidyalaya) is a behavioral intervention which is simple to practice, as no fixed physical postures are to be adopted. It is an art with scientific, psychological, intellectual and spiritual process, which enables invisible latent powers and capabilities to emerge from the inner recesses of heart and mind. It aims at establishing balance in head, heart and hand.

It is the science and art of harmonizing spiritual, mental and physical energy through the connection with the ultimate source of spiritual energy, the Supreme Soul for enjoying ever healthy, ever-wealthy and ever-happy life.

Regular practice of Raja yoga meditation causes improvement in physiological parameters. The longer the duration of meditation, more are the changes. This study was performed with the objective of assessing the effect of short term and long term Brahmakumaris Raja Yoga meditation on physiological variables.

'Rajayoga Meditation' taught by Brahmakumaris world spiritual university contains ample knowledge helping one to develop this attitude. Listed below are just a few of the benefits people all over the world are endorsing/admiring after practicing meditation in health and fitness programs:-

1) Enhances energy, strength, vigor & fitness.

2) Helps keeping blood pressure normal.

3) Creates a state of deep relaxation and general feeling of well-being.

4) Increases concentration and strengthens the mind.

5) Amazing ability to fight stress-buster.

6) Helps reduce heart diseases, weight loss, building self confidence.

Certain studies and statistics carried out on 'Rajayoga Meditation' have shown positive effects on health. Throughout study we want to quantify the effects of Rajayoga meditation on various parameters.

METHODOLOGY

Study Setup: The present study was carried in the Cardio Respiratory Laboratory of Physiology Department in Saraswathi Institute Of Medical Sciences, Hapur.

Study type: Cross-Sectional Study.

Sample Size: 54

Duration Of Study: One year.

Study Population:

Inclusion Criteria: Normal healthy young individual practicing Rajayoga meditation for two different time period and one control group are selected for the present study of 54 individual divided into group A,B&C of age group(18-40Yrs).

Exclusion Criteria: The subjects who were suffering from Diabetes Melitus, Hypertension, Alcohol intake and Cigratte Smoking were excluded from the present study.

STUDY PROCEDURE

Each subjects was informed about the purpose of the study and a written consent was taken.

The BP was measured in sitting position by Mercurical Sphygomanometer taking two reading before and after meditation in each meditators(2-5yrs) &(>10yrs) practice.

The HR, CO, CI, PBF(right upper &lower limbs) were estimated in supine position by NICOMON(L&T, Mysore) which work on the principle of the mean, standard deviation, standard error and P-value were calculated and comparison were made.

TABLE:1

Comparison of Mean and Standard Deviation of all the parameters:-

RAJYOGA STUDIES				
MEDITATORS(2-5 Yrs.)		NON-MEDITATORS	MEDITATORS(>10 Yrs.)	
BEFORE	DURING	Mean±SD	BEFORE	DURING
118.71±10.83	115±7.84	111.52±10.47	118.40±5.66	116±11.02
81.64±9.96	84.80±11.32	81.84±17.35	83.06±10.05	85.33±20.73
75.57±14.32	75±14.40	72±7.31	80.77±7.84	80.38±8.91
4.52±1.21	4.34±1.20	4.23±1.40	4.41±0.82	4.29±0.83
2.77±0.66	2.67±0.63	2.57±0.67	2.68±0.44	2.66±0.38
1.27±0.33	1.33±0.39	1.42±0.19	1.08±0.27	1.13±0.23
0.97±0.45	0.86±0.37	1.28±0.05	0.73±0.17	0.81±0.17

TABLE:2

S.No.	PARAMETERS			2-5Yrs.	Non-Meditators	P-VALUE
1	BLOOD PRESSURE	BEFORE	SYS.	118.71±10.83	111.52±10.47	.049
			DIA.	81.64±9.96	81.84±17.35	.055
2	HEART RATE	BEFORE		75.57±14.32	72±7.31	0.307
3	CARDIAC OUTPUT	BEFORE		4.52±1.21	4.23±1.40	0.553
4	CARDIAC INDEX	BEFORE		2.77±0.66	2.57±0.67	0.406
5	PBF(FORE LIMBS)	BEFORE		1.27±0.33	1.42±0.19	0.482
6	PBF(LEGS)	BEFORE		0.97±0.45	1.28±0.05	0.269

Comparison of P-values(significant) between group-A to group-C shown in table 2

TABLE: 3

S. No.	PARAMETERS			>10Yrs.	NON-MEDITATORS	P-VALUE
1	BLOOD PRESSURE	BEFORE	SYS.	118.40±5.66	111.52±10.47	0.025
			DIA.	83.06±10.05	81.84±17.35	0.011
2	HEART RATE	BEFORE		80.77±7.84	72±7.31	0.002
3	CARDIAC OUTPUT	BEFORE		4.41±0.82	4.23±1.40	0.68
4	CARDIAC INDEX	BEFORE		2.68±0.44	2.57±0.67	0.593
5	PBF(FORE LIMBS)	BEFORE		1.08±0.27	1.42±0.19	0.085
6	PBF(LEGS)	BEFORE		0.73±0.17	1.28±0.05	0

Comparison of P-values(significant) between group-B to group-C shown in table 3:-

TABLE: 4

S.No.	PARAMETERS			2-5Yrs.	>10Yrs.
1	BLOOD PRESSURE	BEFORE	SYS.	118.71±10.83	118.40±5.66
			DIA.	81.64±9.96	83.06±10.05
2	HEART RATE	BEFORE		75.57±14.32	80.77±7.84
3	CARDIAC OUTPUT	BEFORE		4.52±1.21	4.41±0.82
4	CARDIAC INDEX	BEFORE		2.77±0.66	2.68±0.44
5	PBF(FORE LIMBS)	BEFORE		1.27±0.33	1.08±0.27
6	PBF(LEGS)	BEFORE		0.97±0.45	0.73±0.17

Comparison of P-values(significant) between group-A to group-B shown in table 4

RESULTS

The different parameters as systolic and diastolic Blood Pressure, Heart Rate, Cardiac Output, Cardiac Index ,Peripheral Blood Flow in right upper and lower limbs were measured in two groups A and B mediatators and the non-meditators (group-C).Comparison between three groups were made as shown in Table 1.

Also a comparison was done between the meditators of group A&B. The duration of group A meditators doing meditation is 2-5years whereas the duration of group B is >10years. As shown in Table 4.

There was significant difference in the systolic and diastolic blood pressure between the 2-5years meditators and non-meditators. A significant change in the systolic and diastolic blood pressure, Heart Rate and Peripheral Blood Flow (Right upper and lower limbs) were also be seen in comparison of group C(non-meditators) which shows that the practice of meditators helps an individual to lower down the physiological parameters.

There was also significant change observed between the systolic and diastolic blood pressure between group A and group B meditators.

DISCUSSION

Yoga is the ancient India method to attain perfect health. Now yoga is being practice in various forms as rajayoga meditation is widely practiced worldwide. We had tried to find out the effects of rajayoga meditation on Heart Rate, Systolic Blood Pressure, Diastolic blood pressure, Cardiac Output, Cardiac Index and peripheral Blood Flow of right upper and lower limbs on practice Rajayoga Meditation from 2-5years and >10years. We observed that Heart Rate, Systolic and diastolic Blood Pressure are significantly lower in meditators than non-meditators. Moreover the decrease in above parameters was more in subjects practicing Rajayoga for >10years, we also measured the Peripheral Blood Flow of right upper and lower limbs and found that it also decreases in meditators than non-meditators. The decrease in it was more pronounced in meditators of more than 10 years than that of 2-5 years.

Vyas R et al[12] observed that diastolic blood pressure was significantly lower in both short and long term meditators of Raja Yoga meditation as compared to non-meditators. Lipid profile showed a significant lowering of serum cholesterol in short and long-term meditators as compared to non-meditators. However contradictory results have been observed by Telles S et al [13], who conducted study in 18 males with 5-25 years of meditation (mean 10.1±6.2) showing that heart rate during the meditation period was increased when compared to the baseline period, as well as compared to the value during the non-meditation period of control sessions. No significant change was observed during meditation.

Further scientific research on effects of Raja Yoga meditation on other physiological variables like lipid profile, palmar GSR,finger plethysmogram amplitude, skin resistance is needed to assess its beneficial effects. Hence we recommend that Raja Yoga meditation should be incorporated as the basis for an effective behavioral program in the management of diseases associated with lifestyle modification like hypertension, diabetes, coronary heart disease and cancers. For this, awareness needs to be created among masses regarding the positive health benefits of meditation.

Neelam et. Al & Vyas et. Al[12,13] had also found the same types of changes in heart rate, systolic blood pressure and diastolic blood pressure in meditators and attributed these changes to quieting of symphathetic system and activation of para-symphathetic system. We have not observed significant changes in cardiac output and cardiac index in meditators of both groups as compared to non-meditators. Moreover we had been able to demonstrate the peripheral blood flow of right upper and lower limbs are significantly lowered in meditators. The effects are more pronounced in long term meditators.

Sympathetic arousal is expected to be reduced during Raja Yoga practice. Hence the load on heart due to sympathetic arousal is also minimized resulting in an improvement in cardiovascular parameters. Similar findings as in our study were observed in 23 subjects by Gupta S et al[10], attributing decline in HR, RR and BP to the reduction in the level of sympathetic arousal. Meditation is believed to graduallyreduce the sympathetic dominance resulting in better balance between sympathetic and parasympathetic. This should bring about a hypometabolic state resulting in decreased heart rate and blood pressure[11]. The reduction of lactic acid brought about by meditation as observed by Patel G[11] is supposed to be a sign of tension free and peaceful state of mind.

It seems that as Cardiac output and cardiac index is unaltered while peripheral blood flow is decreased, perhaps the blood is directed to vital organs the brain, heart etc to achieve better perfusion of vital organs leading to long term beneficial effects on body.

Various study on practitioners of rajayoga meditation had shown that Vital capacity, Tidal volume, Body metabolic rate found that are significantly high in meditators than non-meditators[12] even serum cholestrol was also shown to be lower.

Yoga has defiantly beneficial effects on physical, mental, emotional effects. These effects seems to be mediated by multiple mechanisms, one is being the balance of sympathetic and parasympathetic. Sympathetic often it seems to have selective effects on various organs.

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A Co-Relation Study between Body Mass Index , Duration of Computer Exposure and Yoga on Stress among Women in Information Technology Sector

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ABSTRACT

Background: Women in India have come a long way after independence from just a skilled homemaker to acquired skills and capabilities at par with their male counterparts. But still more conflict arises with the working women , who are exposed to stress.

Stress in working life may affect the body mass index (BMI) through bio behavioral processes and obesity has now been widely recognized as an important public health problem. Work stress promotes unhealthy eating habits and sedentary behavior and thereby contributes to weight gain. The current study would help in providing information of awareness of overweight and effect of overweight on sustained work with computer, as well as to quantify the stress levels of computer professionals with correlation to their BMI .

Objectives: The present study was designed among healthy women IT professionals,

1. To measure the levels of stress experienced .
2. To study the inter relationship between BMI, duration of computer exposure and stress.
3. To study the impact of yoga practice on the stress levels .

Methodology : This is an observational and co relational study in healthy working women of information technology (IT) sector in the age group of 22-40 yrs . STAI questionnaire (form X) was used to score the stress levels , after they volunteerly agreed to participate in the study.

Main Results: Descriptive and inferential statistical analysis was done in the present study. Out of 40 women, 70 % were in the age group of 21-30 yrs, and 30 % in 31-40 yrs. There is a statistically significant increase in both stress levels and hours of computer exposure, as the BMI increased in the subjects. There is a significant decrease in stress levels in STAI score among subjects practicing yoga as compared to the subjects who don't.

Conclusion : There is a significant positive co relation of age, BMI and hours of computer exposure to psychosocial stress as measured by STAI score.

It is required for the women who do not practice yoga ,to follow stress relief strategies like yoga ,so that they can be fit at their sedentary work and maintain work life balance. This study provides the insight to the Clinicians and organizational setup to formulate well designed training programs to avoid overweight .

Keywords: *Stress, Computer professionals, BMI, Yoga*

INTRODUCTION

The concept of stress is physiological , and the stress response is an organism's fight for survival.[1] It prepares the individual , giving him / her extra

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resources to fight or flight from it. Stress in numerous contexts may affect the risk for obesity through biobehavioral processes and may result in Coronary heart disease, psychosomatic symptoms like depression , and premature aging . [2]

According to the National Institute for Occupational Safety and Health, Job stress is the harmful physical and emotional responses that occurs and Software job is stressful .

A career in IT sector is increasingly marked by struggles against deadlines, rapid mobility in projects, and frequently differing- reporting relationships, collapsing inter-personal relationships at work, and the style of conflict management, temporal dissociation, shift wise working schedules , misuse of free time, and increasing proneness to infections that can lead to despair, distress, pressure, and stress.this may be due to organisational factors and an imbalance of demands, skills and /or social support at work.

When such a situation prevails in the IT sector, a woman software professional has to face all these situations and in addition she often has to take care of other family responsibilities, whose role ambiguity is related to stress, fatigue and tension. Studies have shown the relationship among psychosocial work factors, work stress and musculoskeletal discomfort in men and women IT professionals . [3]

Earlier studies have showed the effect of BMI on work related musculoskeletal discomfort and occupational stress of computer workers. Among men and women there were differing patterns of both exposures to psychosocial working conditions and associations with BMI. Among men, working long hours was positively associated with higher BMI and this association was partly independent of job stress. Among men physical demand was negatively associated with BMI and this association was independent of job stress. [4]

The high prevalence of obesity is a major public health problem because of the association of obesity with chronic health conditions such as coronary heart disease, type 2 diabetes, and some cancers .[5] Chronically elevated levels of stress affect cortisol levels, which have been associated with increased risk for central obesity. [6]

Evidence for an association between stress and physical activity behaviours exists .[7] Experimental studies have demonstrated that acute stress affects dietary behaviors to blunt their stress response or reduce negative emotions . [6, 8] Some types of stress, such as work stress, have been associated with obesity-related behaviors among adults. [9, 10, 11]

Studies have shown a positive association between perceived stress and obesity-related behaviors in a working population . [12,13]

Middle-aged women [14] and university students found a decrease in exercise duration and an increase in the number of missed exercise opportunities as stress increased. Effectiveness of yoga against stress management is well established .[15]

The present study was designed among the healthy women IT professionals,

1. To measure the levels of stress experienced .
2. To study the interrelationship between BMI, duration of computer exposure and stress.
3. To study the impact of yoga practice on the stress levels .

METHODOLOGY

It was an observational and co relational study conducted in 40 female healthy computer professionals in the age group of 21-40 yrs, working in IT companies . The objectives of the study was explained and informed consent was taken. About 40 subjects were selected as per the inclusion and exclusion criteria. BMI was calculated as weight in kgs / height in mtr ^{2}.The subject's name, the company they work for, and the city of working were left optional to maintain anonymity and facilitate unbiased reporting.

INCLUSIONS

Healthy women in the age group of 21-40 yrs who are working in day shift, with computer for at least for more than past six months .

EXCLUSIONS

Women suffering from chronic disorders /psychiatric illness /sleep disorders / neurological illness / refractive errors.

Pregnant women

Medications like anti depressants, oral contraceptives

Smokers and alcoholics: The STAI-X (state trait anxiety inventory) questionnaire was given to them to assess the stress scale.Form X of the STAI [16] contains 20 state anxiety items and 20 trait anxiety items. The state anxiety items are each rated on a 4-point intensity scale, from 1 for "not at all" to 4 for "very much so." Respondents are asked to indicate how they generally feel. Scoring is reversed for anxiety-absent items (e.g., "I feel calm"). The range of scores for each of the two scales is 20–80.

Statistical Methods: Descriptive and inferential statistical analysis has been carried out in the present study. Significance is assessed at 5 % level of significance. The following assumptions on data were made

1. Dependent variables should be normally distributed,

2. Samples drawn from the population should be random,

3. Cases of the samples should be independent.

Analysis of variance (ANOVA) has been used to find the significance of study parameters between three or more groups of patients . Student t test has been used to find the significance of study parameters. Chi-square / Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. The Statistical softwares namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver 2.11.1 were used for the analysis of the data .

RESULTS

Table 1: Age distribution of subjects studied

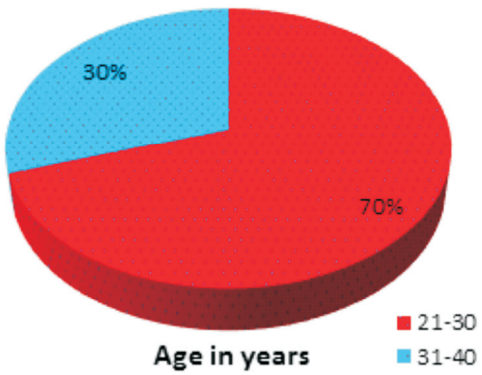

Table 2: BMI (kg/m²) distribution

BMI (kg/m²)	No. of subjects	%	Mean BMI±SD
18-24	22	55.0	21.70±1.5
25+	18	45.0	25.79±1.7
Total	40	100.0	p=0.001*

Mean ± SD: 23.54±2.61

Table 3: Computer exposure hrs distribution

Computer exposure hrs	No. of subjects	%
<8	12	30.0
>8	28	70.0
Total	40	100.0

Mean ± SD: 9.18±1.55

Table 4: Yoga

Yoga	No. of subjects	%
No yoga	22	55.0
Yoga	18	45.0
Total	40	100.0

Table 5: STAI score

STAI Score	No. of subjects	%
≤40	12	30.0
41-50	20	50.0
>50	8	20.0
Total	40	100.0

Mean ± SD: 43.95±8.32

Table 6: Comparison of STAI score and Computer exposure in hrs according to age

	Age in years		Total	P value
	21-30	31-40		
STAI Score	43.39±8.67	45.25±7.64	43.95±8.32	0.525
Computer exposure hrs	8.71±1.54	10.25±0.97	9.18±1.55	0.003**

Table 6 Shows increase in hours of computer exposure in the age group of 31-40 as compared to 21-30, but not statistically significant.There is statistically significant increase in stress levels as depicted by STAI score in the age group of 31-40 as compared to 21-30 yrs.

Table 7: Comparison of STAI score and Computer exposure in hrs according to BMI

	BMI (kg/m^2)		P value
	18-24	25+	
Computer exposure hrs	8.59±1.7	9.88±0.9	0.006*
STAI Score	41.68±9.05	46.72±6.54	0.05$^+$

Table 7 shows statistically significant increase in both stress levels and hours of computer exposure, as the BMI increased in the subjects

Table 8: Comparison of STAI score and Computer exposure in hrs according to yoga practice

	Yoga		Total	P value
	No Yoga	Yoga		
Computer exposure hrs	9.32±1.25	9.00±1.88	9.18±1.55	0.526
STAI Score	47.95±6.37	39.06±7.91	43.95±8.32	<0.001**

Table 8 shows statistically strongly significant decrease in stress levels as indicated by STAI score in subjects practicing yoga as compared to the subjects who don't.

Table 9: Pearson correlation

Pearson correlation	r value	P value
Age in years **vs** STAI Score	0.032	0.842
BMI (kg/m^2) **vs** STAI Score	0.108	0.507
Computer exposure hrs **vs** STAI Score	0.144	0.376

Table 9 shows positive correlation of age, BMI and hours of computer exposure to stress levels as indicated by STAI score but not statistically significant.

Table 10: **Comparison of STAI score and Computer exposure in hrs**

	Computer hours spent			P value
	1-4 hours	4-8 hours	8-12 hours	
STAI Score	-	42.83±10.04	44.43±7.64	0.585

Table 10 shows increase in stress levels when the computer exposure is 8-12 hrs as compared to exposure for 4-8 hrs, but not statistically significant

Table 11: **BMI (kg/m^2) and computers hours**

BMI (kg/m^2)	Computer hours		Total
	<8	>8	
18-24	12(100%)	10(35.7%)	22(55%)
25-29	0(0%)	17(60.7%)	17(42.5%)
30+	0(0%)	1(3.6%)	1(2.5%)
Total	12(100%)	28(100%)	40(100%)

BMI is significantly associated with Computers Hours spent with P<0.001**

DISCUSSION

Computer worker's health is foremost important for better productivity of any IT or BPO Company In this study, maximum percentage of subjects was in the age group of 21-30 years, and 45% of the study group had BMI >25. Out of 40, 28 women worked for > 8hrs with computer,20 women had STAI stress score of 41-50 and 8 had STAI score of >50. Computer workers with high BMI and >8 hrs of computer exposure were found to be at risk of occupational-psychosocial stress, because over weight could be a factor to contribute in increasing of physiological and mechanical load on tissues.

STAI stress score is found to be < 40 among Women who worked > 9 hrs with computer, and who performed regular yoga.

Higher levels of stress [7] inhibits positive health behaviors, ultimately affecting obesogenic behaviours among adults. Over time, the constant state of hypervigilence resulting from repeated firing of the HPA axis can lead to deregulation of the system and ultimately diseases such as obesity, diabetes, autoimmune disorders, depression, substance abuse, and cardiovascular disease which are fast growing epidemics and bane of "modern" society. The holistic science of yoga is the best method for prevention as well as management of stress and stress-induced disorders by its down-regulating effect on both the HPA axis responses to stress.

When energy-dense eating, serves as reward during times of stress or negative emotions, assessment and moderation of caloric intake is absent among individuals.

Brief yoga-based relaxation training normalizes the function of the autonomic nervous system by deviating both sympathetic and parasympathetic indices toward more "normal" middle region of the reference values.[17] Yoga decreases levels of salivary cortisol, [18] blood glucose, [19] and plasma rennin levels, and 24-h urine nor-epinephrine and epinephrine levels, [20] improves body density. [21] Some yoga exercises cause a shift toward parasympathetic nervous system dominance, possibly via direct vagal stimulation and significantly reduces the low-frequency heart rate variability – a sign of sympathetic nervous system activation – in depressed patients following an 8-week yoga intervention. This may be helpful for both anxiety and depression, among women computer professionals by mobilization of energy needed to combat the stressors.

The limitations of this study was that questionnaire did not include measures of stress-related eating behaviors and menstrual history. By using simple questionnaire for measuring the stress levels, we sought to minimize the biases potentially introduced by self-report and decrease the burden on the participant.

CONCLUSION

This study emphasizes the importance of yoga practice by women computer professionals, a mind-body exercise which couples sustained muscular activity with internally directed focus, produces a temporary self-contemplative mental state. By neuro hormonal mechanisms it reduces stress and anxiety, improves autonomic and higher neural functioning .

Further exploration of the role of stress in computer professionals in whom excessive obesity-related behaviors have been documented may benefit future intervention strategies.

Our findings may also suggest that including stress management and/or yoga practice techniques in work site / interventions , fixation of number of hours of computer exposure could reduce the stress levels and obesity prone behavior, among working women in IT sector.

Preventive strategies like training in stress management, frequent screening to identify professional stress and depression at the initial stages and addressing these issues adequately might help the IT professionals to cope with their profession better without affecting their lifestyle and health.

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A Study of Lipid Profile in Sportspersons Performing Various Sports

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ABSTRACT

Regular physical exercise in any form makes lipid profile favorable and reduces the chances of heart attacks and brain strokes. The valuable effects of exercise on plasma lipids have been widely investigated. These changes depend upon the type of sports in which one is indulged.52 male sportspersons participating in 3 different games(basketball players, football players and distance runners) in the Kurnool district were selected for this study. Lipid profile of the three groups was determined and compared to each other. Total Cholesterol (TC), Triglyceride (TG) and Low Density Lipoprotein (LDL) levels were found to be significantly lower in distance runners as compared to football players and basketball players($p<0.05$) . While High Density Lipoprotein (HDL) level was found to be significantly increased in runners as compared to other groups. The results of this study showed that the lipid profile is more encouraging in sports involving more aerobic activity and less physical stress.

Keywords: *lipid profile, football, distance runner, basketball players*

INTRODUCTION

Body fitness prolongs life. Multiple studies have shown that people, who maintain appropriate body fitness, using judicious regimens of exercise and weight control, have the additional benefit of prolonged life. Modern science has eliminated the threat of death from most infectious diseases. Cardiovascular diseases, mostly ischemic heart disease, are now the leading cause of death worldwide. This situation is not limited to developed countries only. The global burden of deaths from cardiovascular diseases has shifted to low-and-middle income countries as lifestyles approach those of high income countries1.The major risk factors for these diseases are sedentary lifestyles, faulty dietary habits, high blood pressure, dyslipidemia, tobacco use etc. These risk factors can be modified by various interventions. Among these interventions, regular physical activity contributes both to the primary and secondary prevention of several chronic diseases and is associated with a reduced risk of premature death.

The cardiovascular diseases usually affect older adults but atherosclerosis, one of the early events contributing to cardiovascular diseases, begins in early life. So the primary prevention should start from childhood[2]. Dyslipidemia is the most important risk factor for atherosclerosis[3]. Sawant et al[4] found increased prevalence of dyslipidemia in 31-40 year old Indian males, suggesting that this group is at increased risk of developing CAD leading to young infarcts.

Regular physical activity has been found to be associated with improvement in lipid profile, with or without dietary intervention[5, 6, and 7]. This improvement has also been found in patients[8, 9]. Aerobic exercise has been shown to increase HDL cholesterol levels while decreasing the levels of Triglycerides and LDL cholesterol level[10, 11]. But it has also been seen that training above the anaerobic threshold has no or even negative effects on blood lipoprotein profiles[12, 13]. The aim of the present study was to analyze the lipid profile in different sportspersons.

MATERIAL AND METHOD

52 male subjects of Kurnool district, AP were selected for the present study. In these, 15 were

basketball players, 20 football players and 17 subjects were distance runners. These subjects were given 1- 2 hours of training in the morning and 1 hour training in the evening. All of these subjects were playing regularly at inter-university and zonal level for the last 3-4 years. All the sportspersons were matched according to the age, height and weight. Institutional ethical clearance was obtained before the beginning of the study.

All the subjects were healthy, non smoker and free of any cardio respiratory disorders. There was no family history of cardiovascular disorders, hypertension, diabetes and dyslipidemia. A written consent was taken from the subjects before the procedure.

Pulse and B.P. were measured after a period of rest. Heart rate was measured by counting radial pulse for a minute while blood pressure reading was taken using mercury sphygmomanometer.

Intracubital venous blood (5ml) was withdrawn from the subjects in the morning (after 12hours of fasting).The blood was then allowed to coagulate for 60 minutes in incubator. The serum was obtained by centrifugation. 100 µl of serum was taken in a small container of the automatic analyzer. The probe takes up 10 µl of serum for each test and puts on a slide having the reagent in dry form. Data of subject was entered in the instrument and after 1 minute result was displayed on screen about HDL, LDL, VLDL, TGL, and S. Cholesterol.

One way analysis of variance (ANOVA) was used to compare the means. Levenne test was used to compare the homogeneity of the variance. When variances were homogeneous, comparisons were made using the post hoc Tukey test; the post hoc Games-Howell test was used for non-homogenous variances. $p < 0.05$ was considered to be significant.

RESULTS

Table 1 shows the basic characteristics of the three groups. There is no significant difference in any parameters.

Table 2 shows the lipid profile in the three groups and the result of ANOVA test. Total Cholesterol (TC), Triglyceride (TG), Low Density Lipoprotein (LDL) and Very Density Lipoproteins (VLDL) levels were found to be significantly lower in distance runners as compared to football players and basketball players. High Density Lipoprotein (HDL) level was found to be significantly increased in runners as compared to other groups. There was no significant difference in any parameters between football players and basketball players.

DISCUSSION

On analyzing our study, the lipid profile is more positive in distance runners as compared to the other 2 groups. Among the sportspersons, runners have more aerobic activity and least anaerobic activity. Aerobic activity has been found to be associated with improvement in lipid profile[7]. On the other hand, athletes who practice in sports, including anaerobic activities, generally have lower values of HDL, lower VLDL, higher TC, TG and LDL in comparison to athletes who practice sports that include aerobic activities[14]. One potential mechanism by which aerobic exercise enhances lipid metabolism is alteration of plasma lipase activity (LPL) and hepatic lipase (HL). Lipoprotein Lipase is key enzyme in the catabolism of TG-rich lipoproteins[15]. Exercise has also been found to improve insulin resistance[16]. Impaired function of LPL has been found in individuals with insulin resistance[17, 18].

Other factor contributing to the lipid profile in football and basketball players is the physical stress[19] in the form of frequent falls, physical contact with other players. The physical stress is minimum in runners. These physical injuries lead to release of proinflammatory cytokines[20, 21] which are associated with abnormalities in metabolism[22]. The level of endotoxin has also been found to release after strenuous exercise[23] which can impair lipid metabolism[24].

Stray-Gundersen ET al[25] showed that low concentrations of total and LDL cholesterol are associated with minimal risk of arthrosclerosis, and aerobic exercise has been similarly associated with a low risk of heart disease. Our study also showed similar patterns in terms of runners.

The sedentary persons, healthy or patients should be advised exercises which involve more aerobic activity and less physical injury e.g. running, jogging, walking etc. As the obesity and dyslipidemia are increasing in the young population, these interventions should start at early age and should be

within guidelines for the age and sex.

Table 1: Mean values (±SD) of basic characteristics

	Runners(15)	Footballplayers(20)	Basketball players(17)
Age(years)	23.4±4.71	24.5±2.57	23.8±3.25
Height(cm)	171.97±3.54	170.44±3.38	171.86±4.76
Weight(kg)	69.33±7.06	70.26±4.91	69.5±7.14
Heart rate(bpm)	60.7 ± 5.02	61.92±5.11	62.74±3.18
Blood pressure			
Systolic(mmHg)	112.73±3.71	110.28±4.02	112.95±5.62
Diastolic(mmHg)	77.06±5.37	78.25±4.47	77.54±5.43

Table 2: Lipid profile in three different groups

	Runners(A)	Football players(B)	Basketball players(C)	P value
TC mg%	163.17±13.52	181.38±15.63	184.41±17.03	A-B<0.05, A-C<0.05
HDL mg%	57.23±5.14	50.97±7.74	48.35±6.83	A-B<0.05, A-C<0.05
LDL mg%	89.43±9.98	98.05±12.32	96.64±16.44	A-B<0.05, A-C<0.05
TG mg%	93.85±8.49	115.38±9.04	101.66±11.41	A-B<0.05
VLDL mg%	27.47 ±8.49	36.77 ±6.49	37.77 ±5.49	A-B<0.05, A-C<0.05
S.Ch./HDL	3.38 ±8.49	4.28 ±6.49	4.78 ±5.49	A-B<0.05, A-C<0.05

CONCLUSION

The observations provided affirmation to the fact that regular physical exercise in the form of sports helps in obtaining a low risk lipid profile than a leisure activity or a sedentary life style. Regular sports activity should be promoted at every level to reduce the risk of cardio vascular disease.

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