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**Dr. R.K. Sharma**

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# A Study to Determine the Prevalence of Premenstrual Syndrome in Young Females

Apeksha Vaishnavi Thodupunuri<sup>1</sup>, Suwaibah Fatima Samer<sup>2</sup>, Mohammed Abrar Hassan<sup>3</sup>

<sup>1</sup>MBBS Student, Bhaskar Medical College, <sup>2</sup>Assistant Professor of Physiology Bhaskar Medical College,

<sup>3</sup>Professor and HOD of Physiology Bhaskar Medical College

## Abstract

**Introduction:** Premenstrual syndrome can be broadly classified as any constellation of psychological and physical symptoms that recur regularly in the luteal phase of the menstrual cycle; remit for at least 1 week in the follicular phase and cause distress and functional impairment. In order to be clinically significant, the symptoms should be of at least moderate intensity and cause functional impairment. Women with premenstrual dysphoric disorder report impaired social adjustment and reduced perceived quality of life, which are at their worst during the luteal phase. Premenstrual syndrome differs from depression and physical symptoms such as bloating, mastalgia and headache. The most common reported psychological symptom is irritability rather than depressed mood.

**Materials and Method:** A cross sectional study has been conducted in Bhaskar medical college from June 2018 to July 2018 sponsored by ICMR, on 150 subjects. Data of 100 was collected on a 29 itemed shortened premenstrual assessment form based on Moos Menstrual Distress Questionnaire. The study protocol and the Questionnaire were presented to the Institutional Ethics Committee (IEC).

**Results:** The results obtained are Based on symptomatology, (i) Percentage of symptoms of PMS less than 50% and Above 50% criteria was considered for statistical analysis.

**Discussion:** Many women have premenstrual cyclic symptoms of psychological or physical nature and sometimes these limit their functional capacity, While PMS is linked to the luteal phase, the cause of PMS is not clear, but several factors may be involved. Changes in hormones during the menstrual cycle seem to be an important factor.

**Conclusion:** As PMS is becoming problem in young girls hampering their life involving physical and psychic symptoms.

**Keywords:** *Premenstrual syndrome(PMS), Premenstrual dysphoric disorder, Premenstrual distress, Moos Menstrual Distress Questionnaire.*

## Introduction

Premenstrual syndrome can be broadly classified as any constellation of psychological and physical

symptoms that recur regularly in the luteal phase of the menstrual cycle; remit for at least 1 week in the follicular phase and cause distress and functional impairment. It is generally accepted that, in order to be clinically significant, the symptoms should be of at least moderate intensity and cause functional impairment. Severe symptoms that are predominantly dysphoric and cause severe impairment are referred to as premenstrual dysphoric disorder<sup>5</sup>. The premenstrual syndrome has been described as the commonest endocrine disorder. Fluhmann<sup>8</sup> defined premenstrual tension as including

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### Corresponding Author:

**Dr. Mohammed Abrar Hassan**

Address: 10-2-164/D, 37, West Marredpally, Road number: 2, Opposite Johnson Grammar School, Secunderabad, 500026 Hyderabad, India

adverse signs and symptoms of a general systemic nature which manifest themselves rhythmically during the later premenstrual or early menstrual phases. He also stated that there is considerable difficulty in describing premenstrual tension as an entity because of lack of adequate information based on large groups of normal women a need exists for detailed investigation. The development of standard method for collecting cross sectional and longitudinal information on menstrual cycle symptoms would appear to be potentially useful both for comparing estimates of the prevalence and severity of symptoms in various populations and for more careful study of the psychological and biochemical correlates of different types of menstrual and premenstrual distress.<sup>7</sup>

Christer and Caplan<sup>5</sup> described premenstrual syndrome as a form of social control and victim blame. Women with premenstrual dysphoric disorder recorded in their medical record might be seen as unfit mothers in child custody cases and as unsuitable candidates for positions of authority or political office, thus leading to increased bias and discrimination against women.

Women with premenstrual dysphoric disorder report impaired social adjustment and reduced perceived quality of life, which, unsurprisingly, are at their worst during the luteal phase. Premenstrual syndrome differs from depression in its wider symptom profile, including physical symptoms such as bloating, mastalgia and headache. The most common reported psychological symptom is irritability rather than depressed mood. Women with mood disorders (unipolar or bipolar) or anxiety disorders may experience significant mood changes in the premenstrual period

## Materials and Method

A cross sectional study has been conducted in Bhaskar medical college from June 2018 to July 2018 sponser by ICMR on 150 female subjects out of which 100 were selected for analysis.

**Inclusion Criteria:** Unmarried girls who were having regular menstrual cycles for the last 6 months in the age group of 18-24 years with or without PMS.

**Exclusion Criteria:** They were excluded if they had any psychological or medical disorder such as thyroid, PCOD or if they had irregular menstrual cycles in the last 6 months, having addictions like smoking drinking alcohol or drugs or those taking treatment for any other diseases.

Data was collected on a 29 itemed shortened premenstrual assessment form based on Moos Menstrual Distress Questionnaire.<sup>6</sup> Psychological, physical, behavioural symptoms were studied for 2 cycles. The number of symptoms present was noted on each day of luteal phase starting from day 14 of the same cycle, assuming total cycle length to be 28 days<sup>1</sup>. The study protocol and the Questionnaire were presented to the Institutional Ethics Committee (IEC) first and prior approval obtained and consent was also taken from the participants and then given to them to be filled prospectively over 2 cycles.

An ICD-10 symptom checklist for PMS was used to identify girls with PMS. The ICD- criteria for PMS includes seven symptoms: minor physiological discomfort, bloating or weight gain, breast tenderness, muscular tension, aches and pains, poor concentration and changes in appetite. Only one of these symptoms is required for diagnosis. Symptoms must be restricted to the luteal phase of menstrual cycle and cease with commencement of menstrual flow<sup>1</sup>

## Results

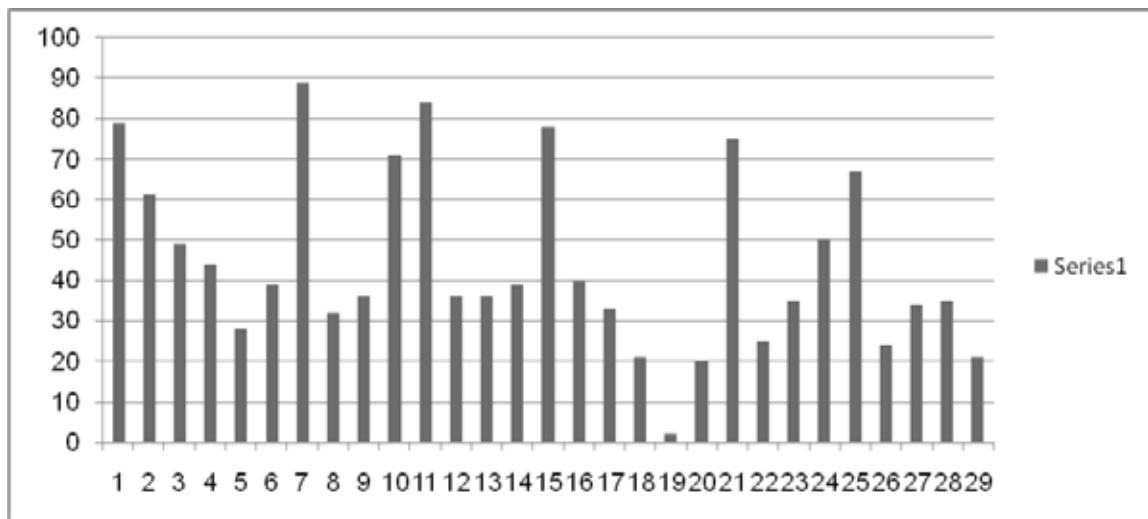
**Based on symptomatology, the results obtained are:**

- (i) **Percentage of symptoms less than 50%:** 1) Confusion-49%; 2) Depressed feeling-44%; 3) Guilty-28%; 4) Hopeless feeling-39%; 5) Loneliness-32%; 6) Lowered selfesteem-36%; 7) Disinterest in life-36%; 8) Abdominal bloating-36%; 9) Absent mindedness-39%; 10) Binge eating-40%; 11) Breast tenderness-33%; 12) Constipation-21%; 13) Oedema-2%; 14) Fainting-20%; 15) Insomnia-25%; 16) Weightgain-35%; 17) Nausea-24%; 18) Prone to violent outbursts-34%; 19) Abstinence from work-35%; 20) Personality Change-21%

**Above 50% criteria was considered for following symptoms in Premenstrual Syndrome:**

- 1) Angered easily-79%; 2) Anxiety-61%; 3) Irritability-89%; 4) Moodiness-71%; 5) Stressful Feeling-84%; 6) Back Pain-78%; 7) General Body Discomfort-75%; 8) Headache-50%; 9) Fatigue-67%.

The data was also subjected to a pre-validated Moos Menstrual Distress Questionnaire which is based on 8 broad parameters, each one include 3-4 sub parameters and specific points are given.



X-Axis indicates all the 29 symptoms, Y-Axis indicates the percentage of subjects with those symptoms.

**The total score obtained in each group:** A) Pain=114; B) Concentration=178; C) Behavioural change=88; D) Autonomic Reaction=94; E) Water retention=75; F) Negative affect=221; G) Arousal=123; H) Control=191

## Discussion

Many women have premenstrual cyclic symptoms of psychological or physical nature and sometimes these limit their functional capacity.<sup>3</sup>

High prevalence of PMS are Estradiol and progesterone level in the luteal phase which affects the neurotransmitters' serotonin and GABA, increased carbohydrate intolerance in the luteal phase. Pyridoxine deficiency- this vitamin plays a role in oestrogen synthesis, dopamine and serotonin production. It is also associated with increased production of vasopressin, aldosterone, prolactin and systemic prostaglandins adversely affecting renal function and contributing to fluid retention and bloating. Fluctuation is the opiate peptide concentration affecting endorphin levels. It is not clear whether PMS is an abnormal response to normal hormone fluctuations or whether hormonal imbalances could lead to premenstrual syndrome.<sup>2</sup>

PMS completely resolves at menopause. Eating 4 to 6 smaller meals per day during the premenstrual period may help reduce symptoms and food craving. Avoidance of salt, caffeine, alcohol, chocolate or simple carbohydrate may alleviate symptoms the benefits of exercise include physical improvements as well as stress reductions.<sup>1</sup>

Ovulation suppressants like Gonadotropin releasing hormone (GNRH) agonists lead to decreased follicle stimulating hormone (FSH) and Luteinizing hormone (LH) release from pituitary resulting in decreased oestrogen and progesterone levels. Use of progesterone in the luteal phase has been one of the strategic measures to treat PMS which holds well even today. Recently selective serotonergic reuptake inhibitors [SSRI] have gained greater importance in the management of PMS.<sup>4</sup>

While Premenstrual Syndrome is linked to the luteal phase, the cause of Premenstrual Syndrome is not clear, but several factors may be involved. Changes in hormones during the menstrual cycle seem to be an important factor; changing hormone levels affect some women more than others.

Girls using psychotropic were excluded ensuring an untreated sample.<sup>6</sup> Chemical changes in the brain, stress and emotional problems such as depression do not seem to cause PMS but they may make it worse. Low levels of vitamins and minerals, high sodium, alcohol and or caffeine can exacerbate symptoms such as water retention and bloating. Magnesium and Calcium deficiencies are postulated as nutritional cause of PMS; studies evaluating supplementation show improvement in physical and emotional symptoms.<sup>1</sup>

## Conclusion

As Premenstrual Syndrome is becoming a common day to day problem in young girls hampering their life involving physical and psychic symptoms. Maximum participants do not seek medical advice and take self-treatment.

Doctors should adopt comprehensive measures to reduce its incidence and improve the quality of life in affected. A significant relation was present between Premenstrual Syndrome and psychiatric involvement and dysmenorrhoea therefore comprehensive efforts should be made by healthcare providers to screen and manage symptoms including dysmenorrhoea efficiently, thereby improving daily functioning, academic performance and professional skills of the students. Irrespective of the age, literacy and socio economic status, most of the women tend to suffer with PMS, which may be understood by them or they may be ignorant of it. As Premenstrual Syndrome is becoming a common day to day problem in young girls hampering their life involving physical and psychic symptoms, in a country like ours often it is even taken as a stigma to discuss the issues related to menstrual cycle.

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethics Committee:** Certificate

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# Impact of Socioeconomic Status on Lipid Profile in Type 2 Diabetic Patients: An Observational Study

Dalia Biswas<sup>1</sup>, Prerna Agarwal<sup>2</sup>, Mousumi Debnath<sup>3</sup>

<sup>1</sup>Prof & Head, Dept of Physiology, JNMC, Wardha, <sup>2</sup>Asst. Prof, Dept of Physiology, JNMC, Wardha, <sup>3</sup>Asst. Prof. Department of Neurosciences, Dr. G.D. Pol Foundation, YMT, college of Physiotherapy, Khar Ghar, Navi Mumbai

## Abstract

**Introduction:** Socioeconomic status, whether assessed by income, education, or occupation, is linked to a wide range of health problems, including low birthweight, cardiovascular disease, hypertension, arthritis, diabetes, and cancer.

**Method:** This was an observational study. 62 patients were included in the study group of research study. The key outcome measures were BMI, Blood Glucose Fasting & Postmeal and total lipid profile.

**Result:** In our study we evaluated the lipid profile in relation to socio-economic status and found that low socioeconomic status (SES) affects the most, followed by middle SES and lastly the least affection is of higher SES.

**Conclusion:** Our data showed that higher income and higher education inversely affects lipid profile in diabetic patients.

**Keywords:** Socioeconomic status, Lipid profile, Type 2 Diabetic patients.

## Introduction

Type II diabetes is a non-communicable disease and a potent risk factor for cardiovascular disease (CVD). In fact, the main risk factor for an acute coronary event is dyslipidemia, as high serum levels of cholesterol are the main factor.<sup>1,2</sup>

Socioeconomic status has traditionally been defined by education, income, and occupation<sup>3</sup>. Socioeconomic status, whether assessed by income, education, or occupation, is linked to a wide range of health problems, including low birthweight, cardiovascular disease, hypertension, arthritis, diabetes, and cancer<sup>4</sup>.

Epidemiologic studies already have shown that there is health inequality in the general population with differing SES; a low educational level or low income

gives rise to higher incidence rates of various diseases and a higher risk of mortality<sup>5,6</sup>.

Dyslipidemia, as with other complex multifactorial diseases, emerges from the interaction of a genetic background with environmental and socio-economic factors. Despite the biological determinants, important epidemiological studies have shown that some social predictors, such as socio-economic stratum and education level, are also associated with changes in the lipid profile and thus influence the development of CVDs. In developed countries, cholesterol levels decrease with the progression to higher socio-economic or education levels, mainly in women.<sup>1,7</sup>

Thus we aimed to investigate the association between blood levels of total cholesterol, high-density lipoprotein cholesterol (HDL-c), low-density lipoprotein cholesterol (LDL-c), very low density lipoprotein (VLDL) and triglycerides (TG) with the different socio-economic and educational strata in the type 2 diabetic patients who are not on lipid-lowering medications.

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**Corresponding Author:**

**Dr. Dalia Biswas**

Prof & Head, Dept of Physiology, JNMC, Wardha

## Method

This was an observational study. 62 patients were included in the research study. The guidelines of the National Diabetes Data Group and the third set of the Adult Treatment Panel of the National Cholesterol Education Program (NCEP ATP III) was used to recruit patients with type 2 diabetes and dyslipidemia.

### Inclusion Criteria:

1. Diagnosis of impaired glucose intolerance based on criteria adopted by the WHO in 1985, which was a fasting plasma glucose concentration of 140 mg/dl or higher or a plasma glucose concentration of 200 mg/dl or higher two hours after an oral glucose challenge.
2. 15-70 yrs of age .

### Exclusion Criteria:

1. History of Psychological problems likely to interfere with participation.
2. Chronic disease that would likely to limit the ability to continue with the study for 6 months
3. Thyroid or Liver disease
4. Physical disabilities deemed likely to interfere with participation in the study.
5. Patients who did not give consent to the study.

The patient underwent a clinical assessment, which included history (a questionnaire) and clinical examination. The variables of questionnaire were age, sex, marital status, personal history (occupation, education, socio-economic status) eating pattern, nutritional status, exercise history, smoking status and family history (including family history of diabetes)

**Outcome Measures:** Baseline anthropometric measurement like height and weight were taken at

recruitment. Body Mass Index or BMI was calculated using the formula- weight in kg divided by height in meter square .

Blood Glucose was measured using a Glucometer namely BG03-Dr Morepen, Gluco one Blood Glucose monitoring system.

The fasting blood samples were analyzed for triglycerides (TG), total cholesterol (TC) and high-density lipoprotein-cholesterol (HDL-C). Total cholesterol was estimated by Enzyme end point method. HDL cholesterol was assessed by enzyme direct method. Triglyceride by GPO-PAP method. LDL cholesterol and VLDL were not separately estimated but calculated. LDL was calculated using the formula: LDL cholesterol = Total cholesterol – [HDL cholesterol + TG/5].

Socioeconomic status (SES) was divided into 3 groups namely Low, Middle and High.

SES Low- Having yearly income less than Rs 50,000 per year and education is pre-secondary.

SES Middle- Having yearly income between Rs 1.5 lacs to Rs 2 lacs per year and education is higher-secondary and above.

SES High- Having yearly income more than Rs 4 lacs per year and education is post graduate and above.

The key outcome measures were BMI, Blood Glucose Fasting and total lipid profile.

**Program Evaluation & Statistical Analysis:** Statistical analysis was done using descriptive, inferential and correlation statistics.

The software used in the analysis were SPSS 17.0 and Graph Pad 5.0 version and  $p < 0.05$  was considered as level of significance.

### Observation:

**Table 1: Distribution of patients according to demographic characteristics.**

Demographic Characteristics	Mean	SD	Range
Age (yrs)	55.52	14.92	16-82
Gender	48/15		
Ht (meter)	1.66	0.10	1.50-1.80
Wt (Kg)	71.47	7.38	59-80

**Table 2: Distribution of patients in three groups according to socio-economic status**

SES	Income	Education	$\chi^2$ -value
Low	48(77.41%)	45(72.58%)	0.29 p=0.86,NS
Middle	10(16.12%)	11(17.74%)	
High	4(6.45%)	6(9.67%)	
<b>Total</b>	<b>62(100%)</b>	<b>62(100%)</b>	

**Table 3: Parameters with their mean values.**

Parameters	Mean	N	Std. Deviation	Std. Error Mean
BMI	26.33	63	3.26	0.41
FBS	227.76	63	42.460	5.35
TC	237.71	63	20.30	2.55
TG	155.17	63	12.37	1.55
HDL	43.71	63	8.03	1.01
LDL	150.71	63	21.98	2.76
VLDL	43.28	63	6.89	0.86

**Table 4: Correlation of SES with lipid profile .**

SES	TC	TG	HDL	LDL
Low	234±20.28	155.12±12.32	43.67±7.03	156±23.92
Middle	228±20.22	145.12±11.32	55.67±8.03	146±20.82
High	210±20.10	138.12±12.12	73.67±7.05	130±21.72

**Table 5: Correlation between Low, middle & high SES and lipidprofile**

SES Low	TC	TG	HDL	LDL
Correlation 'r'	0.023	0.774	0.767	0.989
p-value	0.857 NS	0.0001,S	0.0001,S	0.0001 S.
<b>SES Middle</b>				
Correlation 'r'	0.028	0.654	0.868	0.889
p-value	0.857 NS	0.852,NS	0.0001,S	0.0001 S.
<b>SES High</b>				
Correlation 'r'	0.019	0.574	0.016	0.989
p-value	0.857 NS	0.658,NS	0.845,NS	0.0001 S.

## Result

Table 1 display anthropometric variables. Table 2 shows the distribution of patients as per SES strata. Maximum patients were in the low SES group.

Table 3 finding shows that BMI, FBS, TC, TG, HDL, LDL, VLDL were on the higher side. HDL finding was low.

Table 4 finding shows that value of TC, TG, HDL & LDL was more for low SES as compared to other groups.

Table 5 depicts correlation of low SES with TG, HDL & LDL, correlation of middle SES with HDL & LDL and correlation of high SES with LDL value only.

## Discussion

In our study we evaluated the lipid profile in relation to socio-economic status and found that low SES affects the most, followed by middle SES and lastly the least affection is of higher SES. This indicates that higher income and higher education inversely affects lipid profile in diabetic patients.

Dyslipidemia is a complex disorder influenced by several factors related to genetic background and multiple environmental factors<sup>8</sup>. Dyslipidemia is associated with inadequate nutrition and low levels of physical activity, but also socio-economic disparities. This relationship was explained by McCurley et al<sup>9</sup>, who showed that people of a higher socio-economic status have a reduced risk of dyslipidemia through the mediation action of psychosocial factors (e.g. anxiety, depression and social support).

Sun GZ et al in their study observed a significant positive association between socio-economic status and dyslipidemia, in which total cholesterol and LDL-c were increased in both men and women in the higher socio-economic strata, even after controlling for confounders. Also, higher socio-economic status was associated with an increased prevalence of hypercholesterolemia, regardless of sex. Our data corroborates a previous report by Sun et al<sup>10</sup> in which dyslipidemia was positively associated with socio-economic status in China. Also, dyslipidemia was more prevalent in individuals of higher socio-economic status in urban regions of India<sup>11</sup>.

A possible explanation for this positive association between dyslipidemia and socio-economic status lies in the fact that social improvement facilitates easy access to some attractive unhealthy behaviors (fast food-based diet, physical inactivity, and alcohol and tobacco use)<sup>12</sup>.

Luçandra R et al studied the associations between lipid profile and socio-economic status and they found difference between men and women. They observed that HDL-c and TG levels increased in women from the lower to the higher socio-economic strata, while in men they remained steady throughout the socio-economic categories. These sex differences in the association between socio-economic status and dyslipidemia, they say have been reported by other authors also.. Using data from the European Prospective Investigation of Cancer (EPIC) – Norfolk Study, Shohaimi et al.<sup>1</sup> showed that the association between lipid levels and socio-economic indicators were more evident in women than in men. The

authors showed that women in lower socio-economic strata had higher levels of LDL-c and TG. Corroborating the sex differences reported by Shohaimi et al<sup>1</sup> study conducted in South Korea showed a prevalence of dyslipidemia of 46.8% in men and 31% in women.

Polychronopoulou A et al found in their study that young adults with higher education levels had higher levels of total cholesterol and TG than those with lower education levels<sup>13</sup>. In a rural region of China, a general inverse association was reported between education level and dyslipidemia<sup>10</sup>. Similar data were observed with Greek adolescents<sup>14</sup>. Also, evaluating the Greek participants of the EPIC Study, Benetou et al observed that total blood cholesterol was inversely related to education level in both men and women. Our results partially agree with Benetou et al.'s report, that the higher the education level, the lower the total cholesterol, HDL-c and TG .

Nam et al<sup>15</sup> found different results when dyslipidemia was associated with socio-economic status or education level. In contrast with the socio-economic levels assessed by the score-based questionnaires, education levels per se were not associated with any of the blood lipids tested in fully adjusted regression model in men, but a higher education level was related to lower total cholesterol and LDL-c in women. These results were the opposite when socio-economic status was used.

Himanshu M Rana et al conducted a study in which the diabetic patients presented to a tertiary care hospital in Gujrat belonging to both genders and were from lower socioeconomic strata plus having limited education in their geriatric age group. They found that there is high proportion of obesity, diabetes and hypertension among them<sup>16</sup>.

.Timothy C et al in their large cohort study found that advanced education and increasing income were both inversely associated with incident diabetes . This relationship was largely explained by behavioral factors, particularly body mass index<sup>17</sup>.

Maty et al. found that study participants with <12 years education had 50% excess risk of incident diabetes compared with those with more education (HR=1.5; 95%CI 1.11–2.04)<sup>18</sup>.

House JS et al in their analysis revealed that the relationship between education and diabetes was most affected by behavioral factors. BMI explained the

majority of the SES- DM association explaining 32% of the education and 39% of the income effects respectively. Indeed, lower educational and financial resources are in part associated with more risky health behaviors, lower levels of social support and more adverse physical and environmental exposures <sup>19</sup>.

### Conclusion

Our data showed that higher income and higher education inversely affects lipid profile in type 2 diabetic patients. So stress should be given to improve education of masses at appropriate levels. This will help them in better coping from the disease. Efforts should also be made for increasing employment levels as a govt .policy.

**Conflict of Interest:** Nil.

**Source of Funding:** Self.

**Ethical Clearance:** Obtained from Institutional Ethical Committee before start of study.

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# Psychosocial Factors Associated with Patients with OCD

Devika Raje<sup>1</sup>, Vikas Punia<sup>1</sup>, Nandha Kumara Pujam S.<sup>2</sup>

<sup>1</sup>Assistant Professor, <sup>1</sup>Associate Professor & Head, Department of Clinical Psychology,  
Faculty of Behavioral Sciences, Shree Guru Gobind Singh Tricentenary University, Gurugram

## Abstract

**Background:** Obsessive compulsive disorder is a disabling condition characterized by intrusive thoughts which are intrusive, recurrent and distressing in nature, leading to repetitive compulsive mental and physical acts. There are number of factors which play a significant role in OCD such as behavioral, cognitive, environmental and psychosocial factors. Keeping this in view the present study aims to explore the social support, coping and interpersonal behavior among the patients with Obsessive-Compulsive disorder.

**Methodology:** A sample of 30 patients with OCD and 30 normal control matched on age, education and socio-economic status for which purposive sampling method was used. A Social Support Inventory to explore the perceived social support, Coping Style Questionnaire and Interpersonal Relationship Scale was administered on both the groups.

**Results:** Result indicated that the group of patients with Obsessive- Compulsive disorder scored high on emotional coping and avoidant coping, score less on perceived social support and express less empathy as compared to normal controls. Results also revealed that emotional coping and self- disclosure are the predictors of OCD. On the basis of results of present study, it can be concluded that, Patients with OCD had poor coping, social support and perceived social support as compared to normal controls. The possible implication of the present study could be that Interpersonal behavior is associated with patient's social interaction so future intervention should investigate social cognition, interpersonal effectiveness therapy and training for resilience.

**Keywords:** Psychological Factors, Coping Style, Social Support, Interpersonal Behaviour and OCD.

## Introduction

Obsessive compulsive disorder (OCD) is a disabling condition characterized by intrusive thoughts which are intrusive, recurrent and distressing in nature, leading to repetitive compulsive mental and physical acts. There are number of psychosocial factors which play a significant role in OCD such as behavioral, cognitive, and environmental factors.

Interpersonal factors are also one of the factors which are precipitative and maintaining factors for OCD. As per interpersonal theory, patients with OCD often think and feel burdened to society as well themselves because of the awareness about their irrational behavior but at the same time not able to control their behaviors. As a result, patient with OCD blame themselves for every negative thing that happen in their life and this thought will have impact on their interpersonal behavior or relationship (Shapiro & Stewart, 2011)<sup>1</sup>.

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### Corresponding Author:

**Vikas Punia**

Assistant Professor, Department of Clinical Psychology,  
Faculty of Behavioral Sciences, Shree Guru Gobind  
Singh Tricentenary University, Gurugram  
e-mail: vikas85punia@gmail.com

People with Obsessive compulsive disorder report to have low level of perceived social support because of their symptoms in comparison to the people with healthy control group. Previous researches also revealed that symptoms of OCD can be improved if the family, friends, and the other loved ones have healthy relationship and

supportive communication with the patient (Steketee, 1997)<sup>2</sup>.

It is also established fact that patients with OCD used maladaptive coping style such as isolation of affect and denial of the facts related with their obsessions. Researches suggests that coping mechanism used by the patients with OCD is predominantly lacks adaptive coping (Mortiz et al., 2018)<sup>3</sup>. Several researches identified thought suppression in patients with OCD and used emotional avoidance when exposed to the thoughts and feelings associated with their obsessions (Allen & Barlow, 2009)<sup>4</sup>.

The patients with OCD know about their irrational behaviour and because of this they keep on thinking about negativistic outcome for everything which lays impact on their interpersonal relationships. On the other hand, adequate social support and adaptive coping strategies used by patients with OCD will be helpful for them to maintain adequate interpersonal relationship. In contrary, inadequate level of coping and social support leads to disturbed or poor interpersonal relationship. There are various researches which have explored various psychosocial factors in patients with OCD but none of the research have explored social support, coping and interpersonal behavior in patients with OCD. Hence, present study is designed to fill the gap in the literature with the aim to explore the psychosocial factors such as social support, coping and interpersonal behavior in patients with OCD.

## Materials and Method

**Socio Demographic and clinical Data Sheet:** A semi structured socio- demographic and clinical data sheet was specially constructed for the current study. It consisted of various socio-demographic variables which included age in years, educational qualification, marital status, residential address, religion, income and clinical variables which included duration of illness, onset of illness, family history and treatment history.

**General Health Questionnaire (GHQ-12; Goldberg, 1978)<sup>5</sup>:** The scale is a self- report screening inventory which consists of 12 items. It helps in exploring the psychological distress in general population and it also helps in screening out the population with psychiatric blues among the healthy groups. It is a self-administered screening tool which helps in revealing the difference in clinical states and non- clinical group. 0.80 is the validity for the scale.

**Yale Brown Obsessive Compulsive Scale (Y-BOCS; Goodman, 1989)<sup>6</sup>:** This scale was designed to remedy the problems of existing rating scales by providing a specific measure of the severity of symptoms of OCD that is not affected by the type of obsessive or compulsive traits present. The scale helps in providing the overall picture of past and current symptomatology, it also helps in knowing the severity of current symptoms. It is a scale which is rated by the clinician and provides separate scores for severity of obsessions and compulsions. The reliability of the scale is 0.98 and the validity is 0.89.

**Hamilton Depression rating scale (HAM-D; Hamilton, 1950)<sup>7</sup>:** This is a 21-item rating scale. It is considered to be a very important clinician rating scale which is used to measure the intensity and frequency of symptoms of Depression. The Cronbach alpha reliability for the scale is 0.77 and internal consistency is 0.82.

**Coping style questionnaire (Roger et al., 1993)<sup>8</sup>:** This is a 60-item scale. It investigates coping strategies used by the patient groups as well as the normal controls under four domains- Rational Coping (RATCOP), Detached Coping (DETCOP), Emotional Coping (EMCOP) and Avoidance Coping (AVCOP). The reliability for Rational Coping (RATCOP), Detached Coping (DETCOP), Emotional Coping (EMCOP) and Avoidance Coping (AVCOP) were 0.85, 0.79, 0.80 and 0.74 respectively.

**Social Support Questionnaire (Nehra et al., 1996)<sup>9</sup>:** This is 18 item scale in which seven items are positively worded and seven are negatively worded. It was used widely to assess the perceived social support in an individual. The reliability for the scale is 0.62.

**Interpersonal Relationship Scale (Garthoeffner et al., 1993)<sup>10</sup>:** It is a 49-item scale to assess the overall relationship quality. The scale has been widely used to study the effectiveness of relationship enhancement programs of premarital or marital couples (Gordon & Waldo, 1984)<sup>11</sup>. The reliability for the scale is 0.77 and the validity is 0.94.

The Present study was conducted at SGT Hospital & Medical College, Gurugram and Nur Manzil Psychiatric Center, Lucknow and Purposive sampling method was used in the present study. Sample size consists of 60 subjects, under which 30 patients with the diagnosis of Obsessive-Compulsive disorder and 30 Normal Controls who scored less than 3 on GHQ-12 and matched with



patients with OCD group on age, education and socio-economic status were taken. Patients with comorbid diagnosis of organicity, substance use disorder and severe depression were excluded from the present study.

Among the patient population there were both male and female participants and the mean age of patients were  $33.83 \pm 10.06$  years and mean years of education of patients with OCD were  $11.83 \pm 3.92$  years. In the

present study, most of the patients 60% were from middle from socio-economic status. The mean score of Y-BOCS was  $28.27 \pm 9.67$  which signifies that sample included in the present study were having severe level of obsessive-compulsive disorder and mean score of HAM-D was found to be  $17.90 \pm 7.24$  which indicates that the sample included in the present study was having moderate level of depression.

## Results and Discussion

**Table 1: Showing the Social support between patients with Obsessive Compulsive Disorder and Normal Control (Independent sample t- test).**

Variable	Patients with OCD N=30 Mean + SD	Normal Control N=30 Mean + SD	t	df	p
PGI SSQ	42.53 + 8.40	47.80 + 6.86	-2.65	58	0.014**

\*\*= p<0.01

Table 1 shows the social support between patients with Obsessive Compulsive disorder and Normal Control. It shows the patients with OCD have significantly lower perceived social support (p<0.01) as compared to Normal control.

**Table 2: Showing the coping mechanism between patients with Obsessive Compulsive Disorder and Normal Control (Independent sample t- test).**

Variable	Patients with OCD N=30 Mean $\pm$ SD	Normal Control N=30 Mean $\pm$ SD	t	df	P
RATCOP	28.13 $\pm$ 7.00	30.00 $\pm$ 7.51	-0.99	58	0.32
ENCOP	27.70 $\pm$ 10.05	18.07 $\pm$ 7.18	4.27	58	0.001**
DETCOP	20.56 $\pm$ 5.74	21.20 $\pm$ 6.24	-0.40	58	0.68
AVCOP	24.26 $\pm$ 5.09	20.83 $\pm$ 7.74	2.02	58	0.04*

\*= p<0.05; \*\*= p<0.01

Table 2 shows the coping mechanism between patients with Obsessive Compulsive Disorder and normal control. It shows that patients with OCD showed significantly more avoidant coping (p< 0.05) and emotional Coping (p<0.001) as compared to normal control whereas on rest of the domains i.e. rational coping, and detached coping both the groups were similar.

**Table 3: Showing the interpersonal behaviour between patients with Obsessive Compulsive Disorder and Normal Control (Independent sample t- test).**

Variable	Patients with OCD N=30 Mean $\pm$ SD	Normal Control N=30 Mean $\pm$ SD	t	df	p
Trust	64.80 $\pm$ 12.20	70.73 $\pm$ 11.10	-1.97	58	0.05
Self- Disclosure	53.33 $\pm$ 12.56	50.33 $\pm$ 10.65	0.99	58	0.32
Genuineness	15.83 $\pm$ 3.71	17.03 $\pm$ 3.05	-1.36	58	0.17
Empathy	16.20 $\pm$ 4.71	18.60 $\pm$ 4.44	-2.03	58	0.04*
Comfort	26.06 $\pm$ 4.04	24.33 $\pm$ 4.30	1.60	58	0.11
Communication	8.83 $\pm$ 1.46	8.50 $\pm$ 1.99	0.73	58	0.46

\*= p<0.05

Table 3 shows the interpersonal behaviour between patients with Obsessive Compulsive Disorder and Normal control. It shows that patients with OCD showed significantly express less empathy ( $p < 0.05$ )

as compared to normal control whereas on rest of the domains trust, self- disclosure, genuineness, comfort and communication both the groups were similar.

**Table 4: Stepwise multiple regression of Y-BOCS total as dependent variable and interpersonal behaviour, coping and social support as independent variable.**

Model	Predictor	R	R Square	Unstandardized Coefficient		B	t	F	df	Significance
				B	Std. err					
1.	ENCOP	0.64	0.41	0.61	0.13	0.64	4.44	19.76	29	0.001
2.	IRS Self-Disclosure	0.75	0.57	-0.30	0.09	-0.40	-3.19	18.23	29	0.004

Table 4 shows the significance of Interpersonal Behavior, Coping and Social support was verified for YBOCS- total score in patients diagnosed as Obsessive-Compulsive Disorder ( $n = 30$ ). The regression revealed that in interpersonal relationship Trust, Genuineness, Empathy, Comfort, and communication, in Coping Rational adaptive style, detached adaptive style, and avoidance maladaptive coping style and perceived social support, did not satisfy the inclusion criteria and are hence excluded. Therefore, only two predictor variables i.e. Emotional maladaptive style and self-disclosure were accepted.

The model revealed that emotional maladaptive coping and self-disclosure was contributing significantly and positively towards Y-BOCS Scores. The regression coefficient for emotional maladaptive coping was 0.61 and for self-disclosure is -0.30. Emotional maladaptive coping and self-disclosure explains 0.57% of variance in the YBOCS- Total (Multiple R is 0.75). Finally, K was found to be 27.36 in the contribution of Y-BOCS scores.

The main aim for our study was to explore the social support, coping and Interpersonal behavior among the patients with Obsessive-Compulsive disorder and normal control. And the results of the present study indicated that patients with OCD have significantly lower perceived social support ( $p < 0.01$ ), have significantly more avoidant coping ( $p < 0.05$ ) and emotional coping ( $p < 0.001$ ) and significantly express less empathy ( $p < 0.05$ ) as compared to normal control.

The result of the present study was in the line of previous literature (Pino et al. 2016)<sup>12</sup> which revealed that patient with OCD were unable to understand the mental and emotional states of other people. The reason

behind this is that most of the times patient with OCD remain preoccupied with their obsessions and never understand others perspective which leads towards poor interpersonal relationship and maladaptive coping style. At the same time patient with OCD had significantly less perceived social support as compared to normal controls. The reason behind this is that their family members try to console them or insist them not to perform their compulsions. As a result, patients with OCD perceive it negatively which results in less perceived social support.

The regression model revealed that emotional maladaptive coping and self-disclosure was contributing significantly and positively towards Y-BOCS Scores. The regression coefficient for emotional maladaptive coping was 0.61 and for self-disclosure is -0.30. Emotional maladaptive coping and self-disclosure explains 0.57% of variance in the YBOCS- Total (Multiple R is 0.75). Finally, K was found to be 27.36 in the contribution of Y-BOCS scores.

Therefore, the findings can be conceptualized in a way that emotional maladaptive coping and self-disclosure were found to be significant predictor of Y-BOCS scores. Patients with Obsessive Compulsive Disorder feels that no one understands their condition or illness and because of this they are unable to trust others and they also face difficulty in disclosing their feelings. As a result, they use maladaptive emotional coping style to deal with their problems.

Previous literature also suggests that OCD is associated with several restrictions in their capacity with intimacy. These patients avoid people because they have fear of rejection and they also feel people might break their trust which reveals that they have less emotional

and intellectual intimacy with the partners (Newth & Rachman, 2001)<sup>13</sup>.

### Conclusion and Acknowledgement

As it is evident in the findings that interpersonal behavior is associated with patient's social interaction so future intervention can be devised by incorporating factors which are associated with social interaction of the patient. As the interpersonal domain of these patients is found to be impaired so it is important to include interpersonal effectiveness therapy especially focusing on the domains of emotional coping and self-disclosure. Various other programs can be devised to improve their coping such as – a framework for cognitive preventive treatment and training for resilience can be organized which can help them in dealing with their problems and challenging situations in their daily life. And subsequently that will prevent the vulnerability of Obsessive-compulsive disorder and other diseases.

The possible limitation of the present study is that the result of the present study cannot be generalized as the sample size was considerably small and the presence of a clinical control group such as depression could have given better understanding of the results.

**Conflict of Interest:** The authors declares no conflict of interest.

**Ethical Clearance:** Taken from ethical committee of Faculty of Behavioural Sciences SGT University, Gurugram.

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# A Study on Information Processing by Human Brain

Geetha Shavali<sup>1</sup>, K. Devika<sup>2</sup>

<sup>1</sup>Assistant Professor, Upgraded Dept. of Physiology, Osmania Medical College,

<sup>2</sup>Final year Postgraduate, Upgraded Dept. of Physiology, Osmania Medical College

## Abstract

**Background:** Information gathering and processing by human brain has always perplexed the scientific world. Few evidenced it to be in an analog form while a second school of thought showed it to be digital. There were also a third group who believed it was neither analog nor digital but followed a special signal processing paradigm<sup>[1]</sup>. A small attempt has been made in this study to assess the mode of information grasping by human brain.

**Materials and Method:** Two hundred and fifty undergraduate students studying first year of MBBS (Bachelor of Medicine and Bachelor of Surgery) at Osmania Medical College, Hyderabad were selected for the study after taking consent from institutional ethics committee. An article consisting of 110 words written in jumbled alphabets was selected for the study. As the average reading speed of human beings is 200 to 250 words per minute, the students were instructed to read the article within half a minute and to jot down the words not understood by them on a white sheet. At the end white sheets of all 250 students were collected.

## Conclusions:

1. The study concludes that on a time scale human brain tries to grasp maximum information in minimum time possible, i.e. it takes and processes the information in an analog form
2. Later if needed only it digitalises the information and learns the details.
3. On a temporal framework grasping the information in an analog form gives advantage to the biological system

**Keywords:** *Analog, biological system, digital, signal processing paradigm, temporal framework.*

## Introduction

Biological systems are complex macromolecular systems which acquire, store, process and use information to organise their activities. How the brain represents information has real world impact on how capable we are of dealing with the complexity of reality<sup>[2]</sup>. Neural systems have evolved to maximise their information transmission rate. For this, different parts of the brain may process the signals in different ways<sup>[3]</sup>. Information in humans is stored in two places, the genes and the brain. It is stored as digital information in genes whereas in brain it is still a mystery. Processing of information by the brain can be both digital and analog. Analog deals with continuous signal representing physical measurements relating to the whole form. Digital deals

with time separated signals represented by sequence of discrete variables. For example, Long Playing(LP) record is analog, whereas Compact Disc(CD) record is digital. The human brain processes the information in either form(analog or digital)<sup>[4]</sup>, to the advantage of the biological system appropriate to the time, place, person and need. On a temporal framework, it tries to grasp maximum information in minimum time possible. For this to be achieved it may overlook the details or finer aspects. That is to say it grasps the information in an analog form to get an overall picture. Whereas when it is given adequate time, it tries to grasp the details and the finer aspects i.e. information grasping in digital form. A small attempt has been made in this study to account for this temporal processing.

### Materials and Method

Two hundred and fifty undergraduate students studying first year of MBBS (Bachelor of Medicine and Bachelor of Surgery) at Osmania Medical College, Hyderabad were selected for the study after taking consent from institutional ethics committee. An article consisting of 110 words written in jumbled alphabets was selected for the study. As the average reading speed of human beings is 200 to 250 words per minute, the students were instructed to read the article within half a minute and to jot down the words not understood by them on a white sheet. At the end white sheets of all 250 students were collected.

#### Article:

fi yuo cna raed tihs, yuo hvae a sgtrane mnid too. I cdnuolt blveiee taht I cluod aulacilty uesdnatnrd waht I was rdanieg. The phaonmneal pweor of the hmuan mnid, aoccdnrig to a rscheearch at Cmabrigde Uinervtisy, it dseno't mtaetr in waht oerdr the lttteres in a wrod are, the olny iproamntn thng is taht the frsrit and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and you can sitll raed it whotuit a pboerlm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Azanmig huh? Yaeh and I awlyas tghuhot slpeling was ipmoranttl!

### Results

2 out of 250 students(0.8%) could grasp every word **100% of the article.**

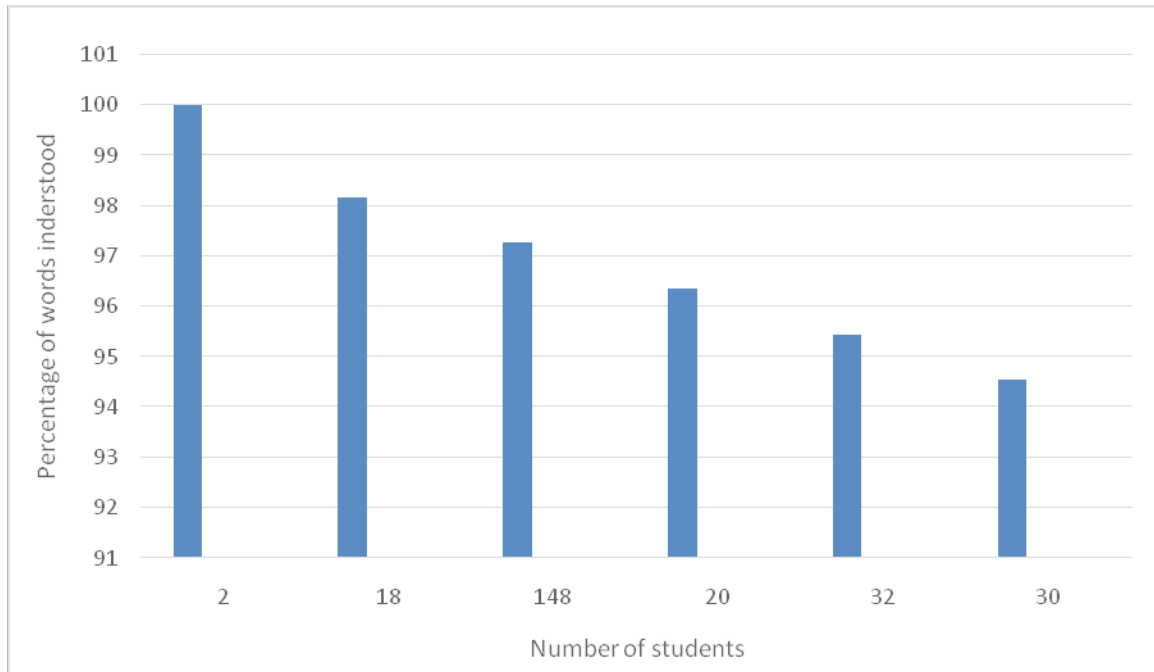
18 students (7.2%) could make out 108 words out of 110 i.e. **98.18% of the article.** They could not make out onlytwo words.

148 students (59.2%) could make out 107 words out of 110 i.e. **97.27% of the article.** They could not make out only three words.

20 students (8%) could make out 106 words out of 110 i.e. **96.36% of the article.** They could not make out four words.

32 students (12.8%) could make out 105 words out of 110 i.e. **95.45% of the article.** They could not make out five words.

30 students (12%) could make out 104 words out of 110 i.e. **94.54% of the article.** They could not make out six words.



**The words which the students could not make out were:**

- i. Cdnuolt (couldn't)
- ii. Aulacly (actually)
- iii. Taht (that)
- iv. waht (what)
- v. taotl (total)
- vi. tghuhot (thought)
- vii. whotuit (without)
- viii. bcuseae (because)
- ix. mtaetr (matter)
- x. rdanieg (reading)

**Discussion**

All two hundred and fifty students could identify the maximum number of words and the information conveyed in the article. They grasped each word as a whole and not each letter or spelling of the word. They concentrated on the spellings only when they could not make out the word. The context also helped them in identification of the words in the article. They grasped the information in analog form and digitalised the words only when they did not understand. This proves that the human brain always tries to accumulate maximum information in minimum time possible to use it when the need arises.

**Conclusions**

1. The study concludes that on a time scale human brain tries to grasp maximum information in minimum time possible, i.e. it takes and processes the information in an analog form.
2. Later if needed only it digitalises the information

and learns the details.

3. On a temporal framework grasping the information in an analog form gives advantage to the biological system

**Ethical Clearance:** Taken from Osmania Medical College Ethics committee.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Prevalence of Anemia among Pregnant Women in Maternity and Children Hospital at Buraidah City

Ibtisam Alrasheedi<sup>1</sup>, Kholud Alrasheedi<sup>1</sup>, K. Chandra Sekhar<sup>2</sup>

<sup>1</sup>Family Medicine Specialist, <sup>2</sup>Professor & Trainer, Family Medicine Academy, Qassim Health Cluster, Saudi Arabia

## Abstract

**Introduction:** Anemia is the common health problem in the developing and developed world and vulnerable groups are pregnant mother, adolescent girls and children. Iron deficiency anaemia exhibits the iceberg phenomenon of the disease.

**Objectives:** To determine the prevalence of anemia, socio-demographic characteristics, dietary habits and some risk factors associations with anemia.

**Materials and Method:** The present hospital based cross sectional study was conducted at Maternity and Children Hospital. A total of 233 pregnant women aged between 18-42 years' age group people were selected and a structured self-administered questionnaire submitted to all eligible pregnant women and hemoglobin estimation report was taken from the lab record. Data cleaned and entered in Statistical Package for Social Sciences (SPSS) 21.0 Version. Necessary statistical tests like simple proportions and chi square tests were applied.

**Results:** Prevalence of anemia among pregnant women was 29.3% in Buraidah city. Prevalence of anemia increases with increasing parity and prevalence of anemia among parity >3 was 35.7%. high prevalence of spacing of > 3 years was observed in 37-42 years' age group. In the study population, 12.5% were giving anemia history, 10.2% were thyroid problems. About 44.7% were taking iron supplements regularly.

**Conclusions:** Based on the study results, the prevalence of anemia was not very high comparatively to other studies conducted in the kingdom. There was no severe anaemia people in our study. Among pregnant women, there is a need to strengthen about the anemia awareness, periodical screening from the adolescent age group, regular intake of iron supplements during pregnancy,

**Keywords:** Age, pregnant women, hemoglobin, parity, spacing, Iron supplements.

## Introduction

Anemia is the most common and widespread nutritional disorder in the world and affecting a large number of children and women in developing countries and also in developed countries especially during

pregnancy. In Saudi Arabia the prevalence of iron deficiency anemia was 30-56 % and half of pregnant women are anemic<sup>(1)</sup>. Knowledge of the current situation in our environment is necessary. This knowledge will enhance early detection and timely management of anemia in pregnancy and better outcome for the baby and mother. Anemia has been a topical issue in many developing countries because of its association with adverse pregnancy outcome such as increased rates of maternal and perinatal mortality, premature delivery, low birth weight, low APGAR scores, fetal physical growth and mental impairment and infant deaths.<sup>(2,3)</sup>

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### Corresponding Author:

**Dr. K. Chandra Sekhar**

Professor & trainer at Family Medicine Academy, Qassim Health Cluster, Saudi Arabia

World Health Organization defines anemia as hemoglobin below 13g/dl for men, 12g/dl for women and 11g/dl as the lower limit acceptable and 10.5g/dl in the second half of pregnancy. Anemia can further be classified into mild anemia (10 -10.9g/dl), moderate anemia (7-9.9g/dl) and severe anemia (<7g/dl (4). An estimated 58.27 million women worldwide are anemic during pregnancy, 95.7% of whom live in developing countries<sup>(4)</sup>. Iron deficiency anemia accounts for 75% of all type of anemia in third world, affecting 30% of population<sup>(5)</sup>.

Globally, Anemia was affected 1.62 billion people which accounts 24.8% of the population. The highest prevalence was found in preschool age children 47.4% and the lowest prevalence was found in men 12.7%<sup>(6)</sup>. Anemia is the most Common nutritional problem worldwide and the most affected population was pregnant women<sup>(7,8)</sup>.

Clients with anemia may be feeling fatigue, pale appearance and shortness of breath, fainting, headache, decrease appetite, palpitation, tachycardia. There are different causes of anemia it may be due to bleeding, hemolytic disease and abortion. Anemia also often due to using of common drugs such as aspirin and ibuprofen, levodopa, quinidine.<sup>(9)</sup> According to the WHO, around 18% of women in industrialized countries are anemic; in the developing world, this rises to 56% and is a contributory factor to women developing health problems and dying during pregnancy and childbirth. Such situation renders both mother and fetal neonatal risks.<sup>(10)</sup> Maternal mortality is one of the prime health indicator in any society, therefore, the health worker in our community should be reduced the incidence of anemia to enhance the health status and prevent complication to a better outcome for baby and mother<sup>(11)</sup>. With this intention the present study was taken up to identify the prevalence and some risk factors associations with anaemia.

### Objectives:

1. To determine the prevalence of anemia among pregnant women attending antenatal care at Maternal and Child Health hospital in Buraidah.
2. To study the socio demographic characters, dietary habits and some risk factors associations with anaemia among the study population.

## Materials and Method

**Study Design and Setting:** This was a hospital based cross sectional study carried out in the antenatal clinic located in maternal and children hospital (MCH) in Buraidah city in AlQassim province.

**Study Period:** This study was conducted from December 2017 to June 2018.

**Target Population:** All pregnant women older than 18 and younger than 42 who visited antenatal clinic in maternal and children hospital in buraidah city in Al Qassim province.

**Sample Size:** Sample size was calculated based on the prevalence of the pilot study conducted by us at maternal and children hospital and prevalence was 30%. Same prevalence was used for the calculation of appropriate sample size in the present study. Sample size was estimated at 5% level of significance with an allowable error of 20%. For the calculation, using the formulae of  $4pq/L^2$ . Thus, the calculated study sample was 233 subjects.

**Sampling procedure:** Every client who visited to maternal and children hospital antenatal clinic who met our study criteria to be considered as study participant in the present study. sample size was estimated 233 however, because there were incomplete questionnaire and rejected some of participants. only completed questionnaire of 215 individuals data was entered in the Statistical package for Social Sciences (SPSS 21.0 version) program for the analysis purpose. Response rate was 92%.

**Inclusion Criteria:** All pregnant married women aged between 18-42 years included in our study.

Not suffering from any mental illness.

**Exclusion Criteria:** Pregnant women who suffered from speech and hearing disorder. Pregnant women who were critically ill.

**Ethical Considerations:** There were no major ethical issues involved in this study as it has been carrying out within the confined area of routine antenatal care. The study was approved by the Research Ethical Committee in AlQassim region. Informed consent was signed by all pregnant women. records were coded and patients'/clinicians' names were not used. All the information collected remained confidential.



**Method of Data Collection:** All Saudi and non-Saudi pregnant female who visited antenatal clinic in maternal and children hospital, data was collected from antenatal record and self-administration Questionnaire. Information collected from antenatal record included socio demographic and biological data/age – nationality gestational age, last hemoglobin was tested.

**Haemoglobin Estimation:** Haemoglobin was assessed by Beckman coulter by department of clinical biochemistry at maternal and children hospital laboratory, Buraidah.

**Pilot Study:** The questionnaire was distributed and data was collected from 30 Clients at MCH Hospital as pilot study. This 30 sample was not included in our analysis.

**Data Analysis:** Frequencies and percentages were calculated and categorical analysis chi-square test

was performed to investigate the significance in the association of the different variables and the prevalence of anaemia.

## Results

In the present study revealed as prevalence of anaemia among pregnant women was 29.3% (63/215) in Buraidah city. Mild anemia was 17.7% and moderate anemia was 11.6%. There was no severe anemia people found in our study. Among all the pregnant women, about 44.7% were taking iron supplements regularly. In the study population, once a week consuming green leafy vegetables, the prevalence of anaemia was high (45.5%). Present study revealed that only 54.4% were taking green leafy vegetables 5-7 times/week and less proportion of pregnant women, only 23.7% were taking eggs 5-7 times/week.

**Table 1: Socio demographic variables association with Anaemia**

Age	Anaemia	No anaemia	Total	P value
18-24	4 (16%)	21 (84%)	25 (100%)	x <sup>2</sup> - 3.16, 3df, P-0.367
25-30	28 (34.1%)	54 (65.9%)	82 (100%)	
31-36	23 (29.4%)	55 (70.6%)	78 (100%)	
37-42	8 (26.6%)	22 (73.4%)	30 (100%)	
<b>Total</b>	<b>63 (29.3%)</b>	<b>152 (70.7%)</b>	<b>215 (100%)</b>	
Occupation	Number of the people	Total sample	Prevalence	
Employed	61	215	28.4%	
Unemployed	154	215	71.6%	
<b>Total</b>	<b>215</b>	<b>215</b>	<b>100.0%</b>	

Table 1 shown that the highest prevalence of anaemia was noticed among 25-30 years' age group and lowest prevalence was noticed among 18-24 years' age group

pregnant women out of 215 pregnant women, 71.6% were unemployed and only 28.4% were employed status.

**Table 2. Gradient of Anaemia in relation to parity, age and Education:**

Parity	No Anaemia	Anaemia	Total	P value
Primigravida	37 (72.5%)	14(27.5%)	51(100%)	x <sup>2</sup> -1.039, 2df, P-0.595
Parity upto 3	88 (72.1%)	34(27.9%)	122 (100%)	
Parity > 3	27 (64.3%)	15(35.7%)	42 (100%)	

Parity	No Anaemia	Anaemia	Total	P value
Age	Spacing < 3 yrs	Spacing > 3 yrs	Total	
18-24	12 (70.5%)	5 (29.5%)	17 (100%)	
25-30	43 (72.9%)	16 (27.1%)	59 (100%)	
31-36	48 (64%)	27 (36%)	75 (100%)	
37-42	16 (55.2%)	13 (44.8%)	29 (100%)	
Education	Primigravida	Parity upto 3	Parity > 3	x <sup>2</sup> - 2.39, 2df, P-0.302
Up to High school	19 (22.3%)	45 (52.9%)	21 (24.8%)	
College and above	32 (24.6%)	77 (59.2%)	21 (16.2%)	

Table 2 clearly shown that the prevalence of anaemia increases with increasing parity and prevalence of anaemia among parity>3 was 35.7%.

**Table 3: Health problems or disease during current pregnancy:**

Health problems	Yes	No	Total
Diabetes	21 (9.7%)	194 (90.3%)	215 (100%)
Hypertension	10 (4.6%)	205 (95.4%)	215 (100%)
Anaemia	27 (12.5%)	188 (87.5%)	215 (100%)
Thyroid problems	22 (10.2%)	193 (89.8%)	215 (100%)
Haemorrhoids	10 (4.6%)	205 (95.4%)	215 (100%)
Any haematological conditions	6 (2.7%)	209 (97.3%)	215 (100%)

Table 3 revealed that in the study population, 12.5% were giving anaemia history, 10.2% were thyroid problems.

**Table 4: Eating PICA and Tea after meal versus anaemia:**

Eat PICA	No Anaemia	Anaemia	Total	P value
Yes	34 (70.8%)	14 (29.2%)	48 (100%)	P> 0.05
No	118 (70.7%)	49 (29.3%)	167 (100%)	
<b>Total</b>	<b>152 (70.7%)</b>	<b>63 (29.3%)</b>	<b>215 (100%)</b>	
Tea after meal	No Anaemia	Anaemia	Total	x <sup>2</sup> - 0.33, 1df, P-0.566.
Yes	47 (73.4%)	17 (26.6%)	64 (100%)	
No	105 (69.5%)	46 (30.5%)	151 (100%)	

Prevalence of anaemia among PICA user was 29.2% and among non-PICA user the prevalence was 29.3%. there was no significant association was observed between PICA users and anaemia prevalence difference. 29.7% (64/215) were consuming tea after main meal.

**Table: 5: Awareness about Symptoms and causes of Anaemia in study group.**

Symptoms	Yes	No	Don't know	Total
Shortness of breath	66 (47.4%)	19 (13.7%)	54 (38.8%)	139 (100%)
Fatigue	86 (61.8%)	12 (8.6%)	41 (29.5%)	139 (100%)
General Weakness	77 (55.4%)	16 (11.5%)	46 (33.1%)	139 (100%)
Loss of Appetite	61 (43.9%)	17 (12.2%)	61 (43.9%)	139 (100%)

Symptoms	Yes	No	Don't know	Total
Dizziness & fainting	102 (73.4%)	8 (5.7%)	29 (20.9%)	139 (100%)
Headache	68 (48.9%)	15 (10.8%)	56 (40.3%)	139 (100%)
Pallor of face, lips and nail beds	101 (72.7%)	9 (6.5%)	29 (20.9%)	139 (100%)
Causes	Yes	No	Don't know	Total
Poor Nutrition	113 (81.3%)	5 (3.6%)	21 (15.1%)	139 (100%)
Bleeding during Pregnancy	57 (41.0%)	20 (14.4%)	62 (44.6%)	139 (100%)
Multiple pregnancies and spacing	39 (28.1%)	22 (15.8%)	78 (56.1%)	139 (100%)
Age at pregnancy	24 (17.3%)	34 (24.5%)	81 (58.3%)	139 (100%)

Table 5 shown that among the anaemia awareness, about 38.8% were don't know about the shortness of breath as a symptom of anaemia and 55.4% were mentioned as general weakness as a symptom of anaemia.

### Discussion

Anemia is one of the main nutritional problems that affecting a large proportion of the population not only in developing country it's also in the industrialized country, in our study the prevalence of anemia among pregnant women was 29.3% in Buraidah, there was no published study of anemia in buraidah city to the best of my knowledge, this overall prevalence was lower compared to the study conducted by Parveen Rasheed, Manal R. Koura, Badria.k Aldabal, Suhair M.Makki, in PHC center in ALKhubar on 498 women, showed the prevalence of anemia among pregnant women was 41.3%.<sup>(12)</sup>

The prevalence of Anaemia was reported less in other study conducted by Riyadh Alzabeb, Osama Alamer among female University student in Tabuk, on 200 female students showed the prevalence of anemia among female students was 12.5%.<sup>(13)</sup> In present study anemia classification which represented the percentage of mild anemia was 17.7% and moderate anemia was 11.6%. Compared my study to other studies, in Dhaka city 37 % were anemic 26% mild anemia and 11 % moderate anemia<sup>(14)</sup>, Slightly higher than our study.

In the current study, the highest prevalence of anemia among pregnant women was noticed among 25-30 years age group and there was no statistical association was found between different age group and anemia status( $p>0.05$ ), similarly finding contrast to our study conducted by Sanku Dey, Sankar Goswami, Madhuchhanda Goswami, in Meghalaya, India<sup>(15)</sup>.

In our study result clearly shown that the prevalence of anaemia increases with increasing parity and prevalence of anaemia among parity  $>3$  was 35.7%. Similar finding was observed in the study conducted in PSMCM/Riyadh, Saudi Arabia by Ali Alghamdi, the age and parity were not associated with the significant statistical change in the hemoglobin level and were not considered as risk factors.<sup>(16)</sup>

Similar finding was observed in the study was conducted in King Abdul-Aziz University hospital, Jeddah, Saudi Arabia by SHARIFA A. ALSIBIAN who found that the risk of anemia was increased with parity, nearly 3-fold higher for women with 2-3 children and nearly 4-fold greater for women with 4 or more children, thus implicating pregnancy<sup>(17)</sup>. Similar finding was observed in Sudan and the study was conducted the antenatal clinic of new Halfa teaching hospital, eastern Sudan in the year 2004, they found no significant association between anemia and parity.<sup>(18)</sup>

In the present study among the Anaemia awareness pregnant women, about 81.3% were mentioned as poor nutrition as a cause of anaemia and only 17.3% were mentioned as age at pregnancy as cause of anaemia, our study result was high to compare the result with other studies, and was conducted in Bhavnagar city, only 13.2% of young college girls were aware of about nutritional diet and anaemia and 44.1% young college girls were aware about anemia.<sup>(19)</sup>

In the present study, revealed that 29.7% (64/215) were consuming tea after main meal. There was no statistical significant difference between tea after main meal and anaemia ( $P>0.05$ ), similarly finding in other studies have reported either significant negative correlations between tea drinking and blood indicators of iron status.<sup>(20)</sup>

In the present study, there was no significant association was observed between PICA users and anaemia prevalence difference, compared to other study, was conducted in University Hospital Center in Marrakech, prevalence of pica among the patients with iron deficiency anemia was 17.5% which was lowest than our result <sup>(21)</sup>.

In the present study, 12.5% were giving anaemia history, 10.2% were thyroid problems, 9.7% were giving Diabetes history. There were associated factors between anaemia and thyroid disease. Similar finding observed in China that IDA affecting thyroid function by decrease plasma T3 and T4 <sup>(22)</sup>. The study has certain limitations connected with design, sample size, sampling procedures, and data collection method. There is no available clinic given to the researcher also there some of the non-Arabic patients not speak English as a language barrier.

### Conclusions

The overall prevalence of anaemia among antenatal mothers was 29.3% and mild and moderate anaemia was reported as 17.7% and 11.6% respectively. The prevalence of anaemia increases with increasing parity. There was no severe anaemia people in the study and further reduction of the anaemia by creating awareness and periodical checking of anaemia screening is required and motivation from the public is important as a community participation model. Balanced diet and additional calories which containing iron rich foods during pregnancy, ideal spacing and parity definitely benefit to the mothers from the protection of anemia. Similar studies are required in our province to substantiate the present study findings.

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**Conflict of Interest:** None

Institutional Ethical Committee clearance taken.

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# Effect of Electromagnetic Waves Emitted from Mobile Phone on Cognitive Functions in Males and Females

K. Singh<sup>1</sup>, Ashita Nain<sup>2</sup>

<sup>1</sup>Professor, <sup>2</sup>Resident, Department of Physiology, Post Graduate Institute of Medical Sciences (PGIMS), University of Health Sciences Rohtak (UHSR), Rohtak-124001, Haryana, India

## Abstract

**Aims and Objectives:** Use of mobile phones always raises the issue of health implications in humans. Gender differences in cognitive abilities have been reported as a neuropsychological feature for many years. So, it was planned to study the effect of electromagnetic waves (EMW) emitted from mobile phone (MP) on cognitive functions in males and females.

**Material and Method:** The present study was conducted in 20 males and 20 female healthy subjects in the age group of 18 to 40 years using mobile phones for the last 5 years or more with per day exposure of at least 30 minutes or more. Subjects with history of diseases of ear, eye and brain (neurological and psychological) or the presence of diabetes, hypertension and consumption of any drug were excluded.

After explaining the whole procedure and seeking a written consent, the Trail making test A (TMT A), Trail making test B (TMT B) and TMT A + TMT B, Single letter cancellation test (SLC test) and the Playing card test (PC test) were performed before and after exposure to MP. Subjects were exposed to MP GSM Type, Samsung Model GT- N 7100, 902, MHz, SAR limit 2.0W/Kg, average power emitted 0.125 - 0.25W/cm<sup>2</sup> for a period of 10 minutes. Statistical analysis was done by statistic package SPSS 20 using paired t test. A value of  $p < 0.05$  was considered significant.

**Results:** TMT A time (sec) was reduced in both males and females, but significant reduction was seen in females ( $< 0.05$ ) after exposure to MP. On the contrary, on exposure to MP TMT B time (sec) was found to be reduced significantly in males ( $< 0.05$ ). But when both (TMT A + TMT B) are combined, significant reduction ( $< 0.05$ ) was found in both males and females after exposure to EMW compare to pre -exposure value. On single letter cancellation test, time is decreased ( $< 0.05$ ) in males, while score decreased ( $< 0.05$ ) in female after MP use. Playing card test score was also found to be reduced ( $< 0.05$ ) in males without any effect in female after exposure to MP.

**Conclusion:** The cognitive functions in males and females are affected differentially by the EMW emitted from MP.

**Keywords:** Mobile phone, Electro-magnetic waves, Cognitive functions, Gender.

## Introduction

Since dependency on mobile phone (MP) is growing at an alarming pace due to Covid-19 pandemic

and present situation of multiple lock downs of long duration. Biological effects resulting from exposure to electromagnetic waves (EMW) emitted from MP have also been demonstrated.<sup>1</sup> It is reported that some aspects of cognitive function and brain physiology may be affected by exposure to EMW emitted from MP.<sup>2</sup> It is also stated that mobile radiation increases the activity of brain, can cause damage to nerves around ears and also to the blood brain barrier (BBB).<sup>3</sup> Also wide spread use of MP is associated with mental health and psychological

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### Corresponding Author:

**Dr. Kiran Singh MD**

House No.: 1155, Sector-1, HUDA Rohtak-124001,  
Haryana

e-mail: dr\_rb\_singh@rediffmail.com

problems in young adults.<sup>4</sup> It is pointed out that there are gender differences in cognitive functions i.e., males outperform females in spatial, working memory tests and mathematics whereas the females outperform males on verbal fluency, perceptual speed and fine motor skills.<sup>5-7</sup> Attributes of cognitive abilities are perception, attention, memory (working and long term), motor, language, visual and spatial processing and executive functions.<sup>8</sup> Cognitive functions can be assessed by battery of tests i.e., trail making, letter cancellation, playing card tests.<sup>9</sup> The trail making tests (TMT) tests the speed of processing, attention, mental tracking and visual search.<sup>10</sup> The letter cancellation test (LCT) indicates sustained attention and visual scanning accuracy.<sup>11</sup> Playing card tests (PCT) examine visual memory and learning process.<sup>12</sup> Therefore it was planned to study the effect of EMW emitted from mobile phone on cognitive functions in males and females.

### Material and Method

The present study was conducted in 20 males and 20 female healthy subjects in the age group of 18 to 40 years using mobile phones for the last 5 years or more with per day exposure of at least 30 minutes or more. Males and females were homogenous in relation to age and educational level. All subjects were right-handed. Clearance was taken from institutional ethical committee. Subjects with history of diseases of ear, eye and brain (neurological and psychological) or the presence of diabetes, hypertension and consumption of any drug were excluded.

After explaining the whole procedure and seeking written consent, the basic parameters like height, weight, heart rate, blood pressure and respiratory rate were recorded from subjects. The TMT - A, TMT - B, SLC

test, PC test were performed before and after exposure to MP.

**Exposure to mobile phone:** Subjects were exposed to MP GSM Type, Samsung Model GT- N 7100, 902, MHz, SAR limit 2.0W/Kg, average power emitted 0.125 - 0.25W/cm<sup>2</sup> for 10 minutes (average duration of a common phone call). During that time examiner was reading a fixed text from a newspaper into another mobile phone, which the subject was hearing. The tests were again conducted after the exposure to EMW emitted from mobile phone.<sup>13</sup> Vital parameters were also recorded after the exposure to mobile phone. Statistical analysis was done by statistic package SPSS 20 using paired t test. A value of  $p < 0.05$  was considered significant.

### Results

Study was carried out in 40 subjects (20 males and 20 females) in the age group of 20 to 40 years (mean 28.75±6.26 in males and 23.25±4.40 in females), having BMI 24.34±2.55 and 21.42±3.16 in males and females respectively. Subjects were using MP for the last 5-9 years; per day exposure was more than 30 minutes. Duration of per call from MP varies from 10 to 30 minutes. Although TMT A time (sec) was reduced in both males and females, but significant reduction was seen in females ( $< 0.05$ ) after exposure to MP. On the contrary, on exposure to MP TMT B time (sec) was found to be reduced significantly in males ( $< 0.05$ ). But when both are combined (TMT A +B), significant reduction ( $< 0.05$ ) was found in both males and females after exposure to EMW. On SLC test, time is decreased ( $< 0.05$ ) in males, while score decreased ( $< 0.05$ ) in female after MP use. PC test score was also found to be reduced ( $< 0.05$ ) in males without any effect in female after exposure to MP (Table 1).

**Table 1: Shows batteries of tests for cognitive functions in males and females before and after exposure to mobile phone**

Variables	Males		Females	
	Before exposure	After exposure	Before exposure	After exposure
TMT-A (sec)	39.20±15.07	34.90±17.93	40.55±15.32	35.75±14.69*
TMT-B (sec)	81.95±30.94	66.30±27.93*	72.00 ±20.34	65.30±15.98
TMT-A+B (sec)	121.15±38.97	101.2±38.77*	112.55±33.55	101.05±24.11*
SLC Test (sec)	21.35±7.37	18.21±6.87*	19.84±5.37	18.38±6.70
SLC Test score (out of 10)	9.30± 1.42	9.20±1.32	9.85±0.49	9.10±0.97*
PC Test score (out of 10)	7.85±2.37	6.3±2.70*	5.75±2.38	5.70 ±2.58

P value \*  $< 0.05$  significant, TMT-Trail Making Test, SLC Test -Single Letter Cancellation Test, PC Test- Playing Card Test.

## Discussion

Gender differences in cognitive abilities have been reported in literature.<sup>7</sup> Male and female brains show anatomical, functional, and biochemical differences throughout life. Origin of differences in male and female brain is not clear, though it is assumed that both biological and environmental factors may play the roles. Biological factors include differences in neurological structures and functions and the differences in hormones i.e., androgen in male and ovarian hormones in female. High and low level of steroid hormonal levels during prenatal developments induce morphological, anatomical and functional differences in brains of males and females and also in later life these hormones have activational effects on behavior. It is also reported that cognitive properties in females, when tested during pre-ovulatory phase (estrogen – female sex hormone, level is high) were comparable to male cognitive properties (testosterone-male sex hormone, is converted in oestrogen in many tissues including CNS). Sex differences in cognitive abilities have also been affected by environmental factors, education background and cultural idiosyncrasies.<sup>14</sup> The differences in test scores between male and female disappears with increase in education level. Results of our study on cognitive functions have shown facilitating effect of EMW emitted from MP. Attention function is differentially enhanced after exposure to EMW emitted from MP and this transient facilitating effect may be dose dependent.<sup>15</sup> TMT-A is more affected in female showing better efficiency of visual scanning and better psychomotor performance.<sup>10</sup> While TMT-B is affected more in males in our study which indicates better executive control and more retention of working memory. TMT improved, supporting the hypothesis that digital mobile phone (DMP) radiofrequency emission improves the speed of processing of information in working memory.<sup>16</sup> It is reported that time completion for TMT-A and TMT-B increases with age<sup>17</sup> and in patients of schizophrenia and traumatic brain injury.<sup>18</sup> In cancellation test also time is more reduced in female (<0.05), pointing females are more attentive. While males scored better. In playing card tests score, females performed better. Symthe and Costall reported sex dependent effects of EMW exposure on human memory. They demonstrated that MP facilitates memory in males and not in females.<sup>19</sup> While Drowing et al stated that females have more command on memory and language.<sup>20</sup> Similarly it was found that out of 131 scores, girls scored 97.5 % and boys 86%

for short memory.<sup>21</sup> Difference in scores on TMT-A and TMT-B may suggest that exposure to MP may have a differential impact on different human attention functions.<sup>15</sup> Also they reported baseline EEG energy of males was greater than that of females, while exposure to EMF decreased EEG energy of males and increased that of females.<sup>22</sup> Although effect on cognitive functions in males and females are not so obvious, but it is clear that MP do have biological effects.<sup>1</sup> Mechanism behind the alterations in the neuro-psychological functions is not clear. But it is suggested that EMWs increase brain activity, can cause nerve damage around ears and may damage blood brain barrier (BBB).<sup>3, 23</sup> Researchers also reported that man complaints of strange feeling in his head after MP use. Localized heating effect while using the MP is also one of the suggested mechanism.<sup>24</sup> It is also reported that effect is not immediate, probably time is needed for physiological changes to take place i.e., heat shock protein production and vascular intimal hyperplasia occur when one is exposed to MP for a period of 30 minutes daily.<sup>15</sup> It is also mentioned that MP exposure can affect cells without heating them.<sup>25</sup> It was found that female nematode worms exposed to MP radiation produced stress hormones, grew 10% larger and produced more eggs. Similarly, micro-wave radiation similar to MP radiation also makes worm more fertile.<sup>26</sup> Differences between two genders may be related to difference in information processing or existence of gender related BBB differences. According to modern plasticity research, it is interesting to mention that brain can adapt and change anatomically and functionally through practice and learning, which varies in male and female depending on situation.<sup>27, 28</sup> So, it is concluded that gender differences in cognitive functions are differentially affected by EMW emitted from mobile phone.

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# A Study on the Impact of Foundation Course on 1<sup>st</sup> Year MBBS Students (2019 Batch) at RD Gardi Medical College, Ujjain

Namit Garg<sup>1</sup>, Hirok Chakraborty<sup>1</sup>, Nitu Kumari<sup>2</sup>, Anita Choudhary<sup>3</sup>

<sup>1</sup>Assistant Professor, Department of Physiology, R.D. Gardi Medical College, Ujjain (M.P.), <sup>2</sup>PhD Scholar, Department of Physiology, S.M.S. Medical College, Jaipur (Rajasthan), <sup>3</sup>Prof. & HOD, Department of Physiology, R.D. Gardi Medical College, Ujjain (M.P.)

## Abstract

**Introduction:** A 1 month foundation course has been envisaged by the Board of Governors to orient the first year medical student to the new professional environment and help him/her to acquire some basic skills.

**Objectives:** To assess student's feedback on various modules of foundation course. To improve the subsequent course.

**Methodology:** A feedback questionnaire was provided to first year medical students before and after the one month foundation course for self assessment of their knowledge skills and confidence before and after the course.

**Result:** 98.6% students participated in the study. There was significant improvement ( $p < 0.05$ ) in student's perception of all the modules before and after the course.

**Conclusion:** Encouraging feedback was obtained. Most of the students enjoyed group work, gained knowledge and improved their skills and confidence.

**Keywords:** Foundation course, orientation, professional ethics, community orientation, language and computer skills.

## Introduction

The Board of Governors in supersession of Medical Council of India has created a Foundation course of one month duration at the beginning of MBBS course. It has been created to sensitize the fresh medical student with the required knowledge and skills that will assist him/her in acclimatizing to the new professional environment. While the institutions are expected to follow the general

guidelines, institutional level changes can be made depending on the content and requirements<sup>1</sup>.

The foundation course has been envisaged to be a one month long program with continued support throughout the year for students to acquire language, communication and computer skills<sup>1</sup>.

The major components of the course include an orientation program, skills module, field visit to community and primary health centre, professional development including ethics, sports and extracurricular activities. Orientation program is considered valuable in lowering the anxiety of new workplace, and can benefit both faculty and the new entrants<sup>2</sup>. This is to be further supplemented by language and Computer skills. These components are multifaceted and require resource faculty

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### Corresponding Author:

**Dr. Anita Choudhary**

Professor and HOD, Department of Physiology, R.D. Gardi Medical College, Ujjain (MP)  
e-mail: dranitats@gmail.com

from various disciplines. Many of these identified areas needed to be followed up by outcome based sessions. Various colleges all over the country have developed and implemented this course so as to acclimatize the students to the new environment as per their resources.

The Medical education unit at R.D. Gardi medical college Ujjain also conducted a 1 month Foundation course involving faculties from various departments as well as from outside the institution so as to provide maximum impact of the course. The faculty of the institute was first trained regarding the objectives of the Foundation program and expert faculty were selected to deliver the lectures and provide demonstrations and hands on sessions on various topics. Faculty of Preclinical departments and Medical education unit coordinated the program.

### **Aims and Objectives:**

#### **Primary Objectives:**

1. To assess students' feedback on all topics of all the modules of the Foundation course namely 1) Orientation module, 2) Skills module, 3) Community Orientation module, 4) Professional Development and Ethics module, 5) Language and Computer Skills, & 6) Sports and Extracurricular activities.
2. To get suggestions for improvement of the course.

#### **Secondary Objectives:**

1. To assess whether the one month course along with yearlong support is actually achieving its purpose.
2. Improving the subsequent course for upcoming batch based on suggestions given by the students.
3. Restructuring of the teaching methodology if required.

### **Materials and Method**

150 students who were admitted on merit in the MBBS course in 2019 as per MCI regulations were selected for the study. After getting requisite permission from competent authorities (ethical clearance from institutional ethical committee of RD Gardi Medical College) data collection process was started. The study participants were approached for obtaining written valid consent, after which consenting individuals were enrolled in the study. A questionnaire including all the

topics of all the modules of the Foundation course were filled and validated.

It was an observational Study. A questionnaire was designed and validated to assess students feedback on all topics of all the modules of the foundation course namely 1) Orientation module, 2) Skills module, 3) Community Orientation module, 4) Professional Development and Ethics module, 5) Language and Computer Skills, & 6) Sports and Extracurricular activities.

Perception was essentially based on the student's assessment of the knowledge, skills and confidence gained after the sessions, based on a four point Likert scale.

0 = Poor    1 = Fair    2 = Good    3 = Excellent

The questionnaire was anonymous and students did not write their names on it so as to provide neutral feedback. Only information regarding gender was taken.

1<sup>st</sup> year MBBS students having more than 75% attendance in the Foundation Course was included in the study. For students admitted late or who have missed some modules of the course, additional classes were arranged so as to complete the modules and fulfill the attendance criteria selected for taking feedback. Those students with attendance less than 75% even after additional classes were not included in the study.

#### **Proforma**

S.No..... Gender ..... M/F

#### **Feedback form for Foundation Course (MBBS BATCH 2019-2020)**

The overall objective of the Foundation course was to sensitize the learner with essential knowledge and skills. This Feedback form is to evaluate the effectiveness of introducing this Foundation Course just after admission in MBBS Course.

#### **How will you rate your knowledge, skills and confidence BEFORE and AFTER the implementation of Foundation Course?**

Please encircle the most appropriate Response:

**0 = Poor 1 = Fair 2 = Good 3 = Excellent**

	<b>Module &amp; Topic</b>	<b>Response</b>				
<b>1.</b>	<b>Orientation Module</b>					
A	Introduction to institution/campus/facilities	Before	0	1	2	3
		After	0	1	2	3
B	Role of doctors in Society	Before	0	1	2	3
		After	0	1	2	3
C	History of Medicine and Alternate systems	Before	0	1	2	3
		After	0	1	2	3
D	IMG roles/overview MBBS curriculum, various career pathways	Before	0	1	2	3
		After	0	1	2	3
E	Principles of Family Practice	Before	0	1	2	3
		After	0	1	2	3
<b>2.</b>	<b>Skills Module</b>					
A	First Aid	Before	0	1	2	3
		After	0	1	2	3
B	BLS	Before	0	1	2	3
		After	0	1	2	3
C	Universal Precautions	Before	0	1	2	3
		After	0	1	2	3
D	Waste management	Before	0	1	2	3
		After	0	1	2	3
E	Immunization	Before	0	1	2	3
		After	0	1	2	3
F	Documentation	Before	0	1	2	3
		After	0	1	2	3
<b>3</b>	<b>Community Orientation Module</b>					
A	National health goals and policies/healthcare systems/community health	Before	0	1	2	3
		After	0	1	2	3
B	Interactions with patients and families, communities	Before	0	1	2	3
		After	0	1	2	3
<b>4</b>	<b>Professional Development and Ethics Module</b>					
A	Concept of Professionalism and Ethics	Before	0	1	2	3
		After	0	1	2	3
B	White Coat Ceremony	Before	0	1	2	3
		After	0	1	2	3
C	Professional behaviour and Altruistic behaviour	Before	0	1	2	3
		After	0	1	2	3
D	Working in a Healthcare team	Before	0	1	2	3
		After	0	1	2	3
E	Disability Competencies	Before	0	1	2	3
		After	0	1	2	3
F	Cultural Competence	Before	0	1	2	3
		After	0	1	2	3
G	Stress management	Before	0	1	2	3
		After	0	1	2	3
H	Time Management	Before	0	1	2	3
		After	0	1	2	3
I	Interpersonal relationship	Before	0	1	2	3
		After	0	1	2	3
J	Learning	Before	0	1	2	3
		After	0	1	2	3

	Module & Topic	Response				
<b>5</b>	<b>Enhancement of Language and Computer Skills</b>					
A	Communication	Before	0	1	2	3
		After	0	1	2	3
B	Local language training	Before	0	1	2	3
		After	0	1	2	3
C	English language training	Before	0	1	2	3
		After	0	1	2	3
D	Computer skills training	Before	0	1	2	3
		After	0	1	2	3
<b>6</b>	<b>Sports and Extracurricular Activities</b>	<b>(Tick Suitable Option)</b>				
A	Sports	Useful	Not	useful		
B	Extracurricular activities	Useful	Not	useful		

Suggestions for Improvement .....

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**Statistical Method:** All statistical analysis was done by the help of appropriate statistical software. Validity of the questionnaire will be assessed by Cronbach’s alpha score  $\geq 0.7$ . For quantitative data frequency distribution, measures of central tendency, dispersion, and graphical representation were applied. For qualitative data frequency distribution, percentage and various diagrammatic representations were applied. Appropriate statistical test like Paired t test were applied. Value of p less than 0.05 will be considered as significant. The analysis was done using the SSPS 24.0 statistical software.

**Data Management:** Data was collected from the study participants and was managed with the help of a separate proforma for each participant. All the data was coded and entered in MS Excel and SPSS software.

**Results**

The results depicted are of 148 out of 150 M.B.B.S first year students of 2019 batch; 2 students did not attend the foundation course due to some personal reasons.

There was no significant difference in both the groups with respect to gender and age.

**Table 1: Assessment of validity of the questionnaire by Cronbach’s Alpha Score**

S.No.	Module	Cronbach’s Alpha Score
1.	Orientation module	0.668
2.	Skills module	0.622
3.	Community orientation module,	0.225
4.	Professional development and Ethics module	0.809
5.	Language and Computer Skills	0.586
	Overall Score	0.878

Data assessed by Cronbach’s alpha score; score  $\geq 0.7$  signified good internal consistency

Table 1 shows the overall Cronbach’s Alpha Score is 0.878 which indicated that there was good internal consistency of the questionnaire which was used for assessment of students in the Foundation course.

**Table 2: Comparison of outcome before and after the implementation of Foundation Course**

		Mean ± SD	t	p (value)
Pair 1	Before Orientation module After Orientation module	-7.926±2.466	-39.094	.000
Pair 2	Before Skills module After Skills module	-10.223±2.605	-47.740	.000
Pair 3	Before Community Orientation Module After Community Orientation Module	-3.284±1.218	-32.799	.000
Pair 4	Before Professional development and Ethics module After Professional development and Ethics module	-15.622±4.769	-39.853	.000
Pair 5	Before Language and Computer Skills module After Language and Computer Skills module	-4.905±1.846	-32.336	.000

Data was presented as mean ± standard deviation (SD); p value < 0.05 was considered statistically significant

Table 2 shows results before and after the application of various modules on various topics used in the foundation course of 2019 1<sup>st</sup> year M.B.B.S students. There was significant improvement in the orientation of the students to the environment and course of the M.B.B.S after the skill module was also statistically significant. The community orientation of the students improved significantly after implementation

of the specific module. There was also significant improvement of knowledge of future doctors about the professional and ethical aspect of doctor's life after attending the module for the above said purpose. There was significant enhancement of language and computer skills of the 1<sup>st</sup> year M.B.B.S students after undergoing the skills learning module.

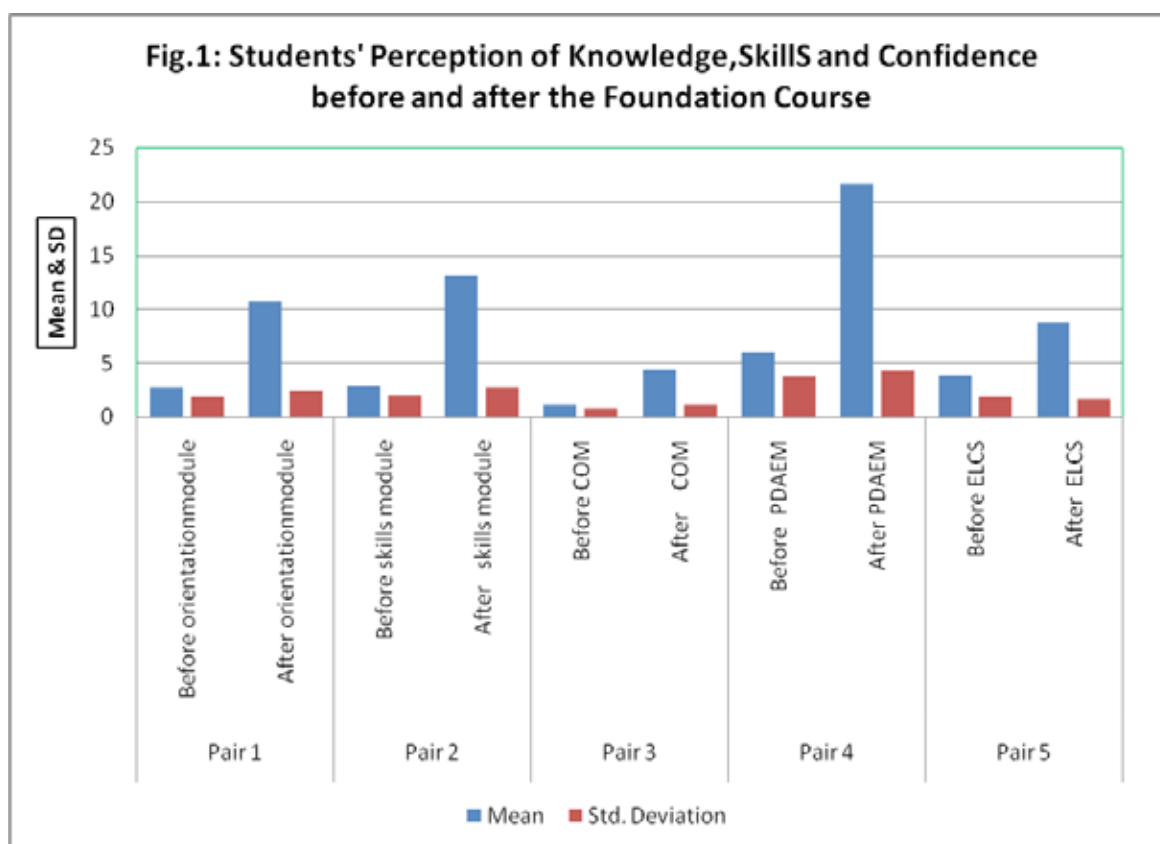
**Table 3: Correlation of perception of knowledge before and after the implementation of Foundation Course:**

		N	Correlation	Sig.
Pair 1	Before Orientation module After Orientation module	148	.374	.000
Pair 2	Before Skills module After Skills module	148	.436	.000
Pair 3	Before Community Orientation Module After Community Orientation Module	148	.226	.006
Pair 4	Before Professional development and Ethics module After Professional development and Ethics module	148	.291	.000
Pair 5	Before Language and Computer Skills module After Language and Computer Skills module	148	.477	.000

p value < 0.05 was considered statistically significant

Table 3 shows results of perception of knowledge before and after the application of various modules in the foundation course of 2019 1<sup>st</sup> year M.B.B.S students.

There was significant and positive correlation between the implementation of foundation course and knowledge of students after the foundation course.



**Fig. 1: Shows improvement in perception of knowledge, skills and confidence of the students after the implementation of the foundation course.**

## Discussion

The present study was undertaken to observe the impact of the foundation course on the students' perception of M.B.B.S course. The Foundation course was introduced by the MCI with the aim to help the newcomers of 2019 MBBS course get oriented to the course of basic medical education in India, the environment pertaining to the study and future workplace of the students, to acquaint them with the professionalism they have to maintain in order to pursue the course and maintain the ethical values related to the profession along with guiding the students to build leadership, communication skills, and other required skills pertaining to the profession of a M.B.B.S doctor<sup>1</sup>. We analyzed our study results and found that there was statistically significant difference of knowledge and information between pre and post scores of various modules of foundation course.

Before the implementation of the foundation course, many students did not know much about the institution they are going to continue their M.B.B.S course, many

were not well equipped with the knowledge of the role of the doctors in the society. The program also serves to introduce the newly admitted students to their batch mates and the faculty and will be helpful in promoting effective small groups during the course of study<sup>2</sup>. Our study found significant improvement in the development of skills of the students after they underwent training and moderation in the skills module, in fact the 't' value (47.740) was maximum before and after the implementation of the skills module. The findings of our study find support in the study by Dixit R et al<sup>4</sup> who also reported improved scores in perception of various modules in foundation course and overall rating for the foundation. Devi J et al<sup>5</sup> found that there is a eternal impact of orientation program in acquainting students with multiple arenas of medical curriculum. It is the first decisive step in the long journey of medical education.

We searched the literature thoroughly but could not find many studies in favor or against the finding of our study, as foundation course was recently (August 2019) inducted in the 1<sup>st</sup> year M.B.B.S curriculum as per MCI directives.



Some studies similar to foundation course were conducted, although not full scale one month course as suggested by MCI but included familiar topics like orientation program, computer language training, professionalism, etc<sup>4</sup>. Findings of our study are in support with the study by Suman s et al<sup>6</sup> who also found improvement in computer skills in half of the total students following application of an introductory course. In contrast to our findings Himanshu et al did not find any significant improvement of prior knowledge of professional etiquettes and ethics, communication and behavioral skills, community health care, time and stress management among the respondents<sup>6</sup>. Similar to the results of our study, the study conducted by Mittal R et al<sup>7</sup> and Francis A et al<sup>8</sup> on M.B.B.S. 2<sup>nd</sup> year students also observed a greater extent of knowledge gain in topics like professional etiquettes and ethics, communication and behavioral skills, community health care, time management and stress management.

Patel J et al<sup>9</sup> reported that foundation program for MBBS students at the level of entry, as suggested by the Medical Council of India, helps reduce anxiety of the students and enhances their confidence level.

Our study had some limitations. Student view was taken only by using a questionnaire developed by the authors. Reliability of the questionnaire was tested using Cronbach's alpha but validity was not tested. The questionnaire formed by the authors was not pre-tested. The new foundation program will be able to fulfill the objectives of the students and the faculty members. We will again review this proposed program, after running it for some years.

### Conclusion

In our study we found the rating of the foundation course given by the students in the feedback form to be very encouraging. Most of the students not only gained knowledge and improved their skills, but the foundation course also helped them in boosting their confidence level. As the foundation course is a new initiative taken by the MCI for overall betterment of medical (professional) education in India, we suggest that this type of feedback about the program will also help in generating new innovative ways and ideas of teaching which will be beneficial not only for the students but the medical fraternity as a whole and ultimately health of our society and country.

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**Conflicts of Interests:** Nil

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# Effect of Aerobic Dance on Cardiorespiratory Fitness in Pregnant Women: A Randomised Controlled Trial

Nayela Sayeed<sup>1</sup>, W. Nagadeepa<sup>2</sup>, Vemulapalli Ravi Kuma<sup>3</sup>, Penjuri Subhash Chandra Bose<sup>4</sup>

<sup>1</sup>Assistant Professor; Physiology, Shadan Institute of Medical Sciences, Telangana. Professor, Physiology, MNRMC, Fasalwadi, Sangareddy, Telangana-502294, <sup>2</sup>Professor Physiology MNRMC, Fasalwadi, Sangareddy, Telangana-502294, <sup>3</sup>Associate Professor, Dept. of Pharmacology, MNR College of pharmacy, Fasalwadi, Sangareddy, Telangana-502294, <sup>4</sup>Professor Dept. of Pharmaceutics, MNR College of pharmacy, Fasalwadi, Sangareddy, Telangana -502294.

## Abstract

**Introduction:** It is recommended that healthy pregnant women should undertake moderate physical activity for 30 minutes on most days of the week throughout pregnancy<sup>1,4</sup>. The aim of the present study was to evaluate the effect of a 12-week programme of twice-weekly aerobic dance classes, in addition to 30 minutes of moderate self-imposed physical activity on the remaining week days, on cardiorespiratory fitness in primiparous women.

**Material and Method:** This study was a secondary analysis of a randomized controlled trial comparing a group undertaking aerobic exercise with a non-exercising control group.

**Results and Conclusion:** This study showed that a 12-week aerobic dance programme had no effect on cardiorespiratory fitness in pregnant women. It has been reported that even small improvements in cardiorespiratory fitness may cause an overall lower mortality rate in adults<sup>24,25</sup>.

**Keywords:** Aerobic Dance, Cardiorespiratory Fitness, Pregnancy.

## Introduction

It is recommended that healthy pregnant women should undertake moderate physical activity for 30 minutes on most days of the week throughout pregnancy<sup>1-4</sup>. Observational studies have shown that pregnant women have a low level of physical activity, and few women exercise on a regular basis<sup>5-7</sup>. It is known that physical fitness is more important than the level of physical activity for the achievement of health benefits in the general population<sup>8-10</sup>. As such, the focus during pregnancy should be to maintain physical fitness

A Cochrane review<sup>11</sup> concluded that regular exercise during pregnancy seems to improve or maintain cardiorespiratory fitness. However, the authors stated that the studies were generally of low methodological quality of the reference list and an additional search on PubMed (up to February 2010) only identified two randomized controlled trials of high methodological quality<sup>12,13</sup>. Pregnancy leads to physiological and anatomical changes that may affect women's cardiorespiratory fitness. Firstly, weight gain leads to a progressive decline in performance<sup>14</sup>. Secondly, there is an increase in blood volume and heart rate<sup>15</sup>, the maximal heart rate is reduced and the blood has a lower concentration of hemoglobin during pregnancy<sup>14</sup>. Thirdly, minute ventilation increases by almost 50%<sup>15</sup>. Hence, these changes lead to reduced reserve work capacity in pregnant women.

The aim of the present study was to evaluate the effect of a 12-week programme of twice-weekly aerobic

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### Corresponding Author:

**Dr. W. Nagadeepa**

Professor Physiology MNRMC, Fasalwadi,  
Sangareddy, Telangana -502294  
e-mail: drdeeparamesh6@gmail.com

dance classes, in addition to 30 minutes of moderate self-imposed physical activity on the remaining week days, on cardiorespiratory fitness in primiparous women

**Material and Method:** This study was a secondary analysis of a randomized controlled trial comparing a group undertaking aerobic exercise with a non-exercising control group. The study was conducted in the Physiology Department, MNR Medical College, Sangareddy. In total, 105 women were randomized to either the exercise group (n = 52) or the control group (n = 53). Of these, 62 women (exercise group, n = 34; control group, n = 28) completed baseline and post-intervention fitness.

**Table 1: Aerobic dance exercise programme.**

Time	Part	Intensity
5 minutes	Warm-up	
35 minutes	Aerobic dance	12 to 14 (somewhat hard) on the Borg scale
15 minutes	Muscle Exercises	12 to 15 repetitions, maximum three sets

**Inclusion Criteria:** Healthy primiparous women who had not participated in a structured exercise programme (>60 minutes once per week), including brisk walking (>120 minutes per week), during the past 6 months were eligible for the trial. Other inclusion criteria were gestational age of 12 to 24 weeks, and able to read and understand instructions. Those subjects who were willing to participate in the study were included after obtaining informed consent.

#### Exclusion Criteria:

**Included:** Severe heart disease, pregnancy-induced hypertension, history of two or more miscarriages, bleeding after 12 weeks of gestation, uncontrolled thyroid disease, preeclampsia, or other diseases that could interfere with participation<sup>1</sup>.

#### Study Design: Randomized controlled trial

**Statistical Analysis:** Background variables are presented as means with standard deviations (SD) and frequencies (%). Between the groups at baseline were examined using a two-sided independent sample t-test for continuous variables, and Chi-squared test for categorical variables<sup>16</sup>. The principal analysis was based on participants who had completed both baseline and post-intervention fitness tests (exercise group, n = 34; control group, n = 28). In addition, per-protocol

analysis was undertaken based on participants with 80% adherence to the exercise protocol (19 exercise classes: exercise group, n = 18; control group, n = 28). The women in the exercise group were significantly older than the women in the control group; therefore, analysis of covariance was used to examine the difference in change in cardiorespiratory fitness between the groups<sup>17</sup>. The post-intervention score for cardiorespiratory fitness was set as the dependent variable, and baseline score and age were set as covariates<sup>18</sup>. Statistical analyses were conducted in Statistical Package for the Social Sciences Version 18 (SPSS Inc., Chicago, IL, USA), and the level of statistical significance was set at  $P < 0.05$ .

## Results

In total, 105 women were randomized to either the exercise group (n = 52) or the control group (n = 53). Of these, 62 women (exercise group, n = 34; control group, n = 28) completed baseline and post-intervention fitness tests. Fig. 1 (see online supplementary data) shows the flow chart of participants. Since there was a high drop-out rate, only women who performed both fitness tests were included in the analyses<sup>19</sup>.

The participants' personal characteristics are shown in Table 2. Women in the exercise group were significantly older ( $P = 0.03$ ) than

**Table 2: Personal characteristics at baseline in the exercise (n = 34) and control (n = 28) groups.**

Characteristic	Exercise n = 34	Control n = 28
Age (years), mean (SD)	31.5(3.2)	29.5(4.0)
Gestational week mean (SD)	17.1(3.9)	18.5(4.4)
Height (m), mean (SD)	1.68(0.1)	1.70(0.1)
Pre-pregnancy weight (kg), mean (SD)	64.9(9.5)	66.4(8.4)
Weight (kg) a, mean (SD)	68.9(9.9)	71.3(8.2)
Pre-pregnancy body mass index (kg/m <sup>2</sup> ), mean (SD)	22.9(3.2)	23.0(2.9)
Married/living together, n (%)	33(97.1)	28(100)
Daily smoker, n (%)	1(2.9)	0(0)

SD, Standard Deviation.

a Measured at baseline.

Women in the control group, Apart from age, there were no significant differences in background variables between the two groups at baseline<sup>20</sup>. Furthermore, no significant differences in measurement of the outcome variables between the groups were found at baseline (Table 3).

**Table 3: Oxygen uptake, work load, heart rate and rating of perceived exertion (RPE) at Levels 1, 2 and 3 in the exercise and control groups at baseline and after the intervention, and mean adjusted difference in change between the groups<sup>21</sup>.**

Variable	Group	No. of Participants ( <i>n</i> )	<i>P</i> -value of difference in change
<b>VO2 (ml/kg/minute)</b>			
Level 1	Exercise	34	0.48
	Control	25	
Level 2	Exercise	31	0.98
	Control	24	
Level 3	Exercise	24	0.89
	Control	19	
<b>Work load (inclination %)</b>			
Level 1	Exercise	33	0.14
	Control	28	
Level 2	Exercise	32	0.67
	Control	27	
Level 3	Exercise	26	0.22
	Control	21	
<b>Heart rate (beats/minute)</b>			
Level 1	Exercise	34	0.85
	Control	28	
Level 2	Exercise	32	0.52
	Control	27	
Level 3	Exercise	26	0.23
	Control	21	

The women in the exercise group attended a mean of 20 (SD 12) out of 24 aerobic dance classes. Eighteen of 34 women (53%) in the exercise group completed the prescribed exercise, protocol (80%) with 19 aerobic dance classes. Thirty-two of 34 women (94%) in the exercise group returned their exercise diaries. In addition to the aerobic dance classes, women in the exercise group reported a mean weekly exercise time of 90 (SD 73) minutes in their exercise diaries<sup>22</sup>. Walking was the most common form of exercise, followed by cross-country skiing, biking, muscular strength training and swimming. No exercise-related injuries or other adverse events were reported by the participants in the exercise group. Two of 28 women (7%) in the control group reported that they had exercised at a moderate level of intensity at least twice per week for a minimum of 60 minutes during the intervention period<sup>23</sup>.

**Change in cardiorespiratory fitness:** The numbers of participants in the analyses vary as some participants did not continue the test to Levels 2 and 3 and because of error during tests<sup>24</sup>.

**Oxygen uptake:** The differences in change in relative VO<sub>2</sub> (ml/kg/minute) between the groups were not significant at Level 1, 2 or 3 (Table 3). Nine of 34 (26%) women in the exercise group had an increase in VO<sub>2</sub> (ml/kg/minute) after the intervention, compared with five of 25 (20%) women in the control group (*P* = 0.56). Furthermore, there were no significant differences in change in absolute VO<sub>2</sub> (l/minute) between the groups at any level<sup>25</sup>.

**Work load:** There were no significant differences between the groups in change in work load at Level 1, 2 or 3 (Table 3). Four of 33 (12%) women in the exercise

group walked at a higher inclination before onset of blood lactate accumulation after the intervention, compared with only one of 28 (4%) women in the control group ( $P = 0.36$ )<sup>26</sup>.

**Heart rate:** There were no significant differences between the groups in change in heart rate at Level 1, 2 or 3 (Table 3). Both groups had a lower heart rate at onset of blood lactate accumulation after the intervention, indicating a lower intensity at the same blood lactate level. There were no differences in the proportion of women with a higher heart rate before onset of blood lactate accumulation after the intervention between the groups ( $P = 0.88$ )<sup>27</sup>.

**Rating of perceived exertion:** The differences between the groups in change in RPE on the Borg scale were not significant at Level 1, 2 or 3 (Table 3). Nineteen of 34 (56%) women in the exercise group and 10 of 28 (36%) women in the control group reported a lower RPE during the post-intervention fitness test ( $P = 0.13$ ).

Per-protocol analyses (data not shown) based on participants with  $\geq 80\%$  adherence to the exercise protocol (exercise group,  $n = 18$ ; control group,  $n = 28$ ) did not change any of the above mentioned results<sup>28</sup>.

## Conclusion

A 12-week aerobic dance programme had no effect on cardiorespiratory fitness in pregnant women. Further randomized controlled trials of high methodological and interventional quality on the effect of regular exercise on cardiorespiratory fitness in sedentary pregnant women are warranted.

**Conflict of Interest:** Nil

**Source of Funding-** Self

**Ethical Clearance:** It was given by the institution.

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# Effects of Pranayama on Human Memory Improvement

Nivriti Singh<sup>1</sup>, Prabodh Bansal<sup>2</sup>, Shikha saxena<sup>3</sup>, Suparna Ghosh<sup>4</sup>

<sup>1</sup>Associate Professor, Rohilkhand Medical College, Bareilly (Uttar Pradesh), <sup>2</sup>Associate Professor Surgery, Rama Medical College and Research Centre Hapur UP, <sup>3</sup>Associate Professor, Rohilkhand Medical College, Bareilly UP, <sup>4</sup>Professor, East Point College of Medical Sciences, Bangalore

## Abstract

**Aim and Objective:** The purpose of this study is to evaluate results of memory scores in normal healthy adult. Brain areas involved in memory such as the hippocampus, the amygdala, the striatum, or the mammillary bodies are thought to be involved in specific types of memory. Pranayama is to control the body function by controlling our breath

**Materials and Method:** This study was conducted in the yoga center on 62 subjects. Subjects were trained for breath holding yoga training. they performed for total of 30 minutes duration daily. At the end of four week the subjects were examined by WECHSLER memory scale.

**Observations:** The results showed increase in scores of all types of test DSF, DSB, and all are highly significant  $P < 0.001$ .

**Results:** All the scores of Wechsler memory scales are highly significant after pranayama.

**Conclusion:** The repeated measure ANOVA analysis revealed a significant increase in memory. This study concludes that yoga enhances numerical data retrieval mostly as a result of left-brain activation.

**Keywords:** Digit Span Forward, Digit Span backward.

## Introduction

Pranayama is to control the body function by controlling our breath. Breathing is the most important function of the body. Nasal cycle is alternate patency of both the nostril every two to eight hours<sup>1</sup>. From the physiologic point of view there are two types of memory. Explicit memory and implicit memory. Short term memory lasts in few seconds to minute and long-term memory which stores memories for years and sometimes for life<sup>2</sup>. Working memory is a form of

short-term memory which keeps data for very short period<sup>3</sup>. We recall it after few minutes without rehearsal capacity of short- and long-term memory can be increased by chunking<sup>3</sup>. Atkison-Shiffrin model<sup>3</sup> shows the recognition memory task and recall memory task. Memory depend upon encoding and recall<sup>4</sup>.

## Material and Method

This study was conducted in the yoga center. The project was approved by the Institutional Ethics Committee. A code was provided to the subjects to keep their identity closed. Their achievement scores were not disclosed to anywhere. Results of our scores were used only for this research. The study was conducted on 62 Young healthy subject of either gender having good general physical condition with age group 20-40 years with average body mass index.

Subjects with the history of Hypertension, Tuberculosis and major psychiatric illness, Smoking,

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### Corresponding Author:

**Nivriti Singh**

Associate Professor, Department of Physiology,  
Rohilkhand Medical College, Bareilly (Uttar  
Pradesh)-243006

e-mail: drnivriti@gmail.com

alcohol intake, Long term drug therapy for any disease were not included. Stress was checked by DASS scale and Subject with moderate to very severe either depression, anxiety or stress were not included.

The present study was cohort study on 62 normal subjects, the study started as four-week pranayama breath control training subjects were asked to take deep inhalation through the left nostril and keep the right

nostril closed with the ring finger of right hand. Hold the breath for few second and exhale slowly through right nostril keep the left nostril closed subject performed for total of 30 minutes duration daily for 30 days. At the end of four week the subjects were examined by WECHSLER memory scale. The data was analyzed applying repeated measured ANOVA test using statistical software package.

## Observations:

**Table 1: Scores of Wechsler Memory Scale before and after**

S.No.	Wechsler Memory Scale	Before	After	P value
1.	Digit Span Forward	5.34±.11	6.43±.07	<0.0001
2.	Digit span backward	4.34±.02	5.01±.03	<0.0001

Results of DSF were  $t=65.82$ ;  $df=112$ ;  $SED=0,017$   $P<0,0001$

Results of DSB were  $t= 146.31$ ;  $df=122$  and  $SED=0.005$   $P<0.0001$

The results showed increase in scores of all types of test and all are highly significant  $P<0.0001$ . It may be concluded from above mentioned finding of the study that with the intervention of pranayama, Memory performance improves. So, it is suggested that pranayama should become a regular part in our life.

## Discussion

The present study was done to evaluate the memory scores after pranayama training. The study comprised of 62 subjects. The findings of this study reveal that the subjects experienced breath holding yoga module performed better in all two types of WMS test including Digit span forward, Digit span backward. These results are in tune with another study, and found that meditation, practiced over long periods, produces definite changes in perception, attention, and cognition<sup>11</sup>. Other study showed that yoga techniques are helpful in reducing anxiety and stress and improvement in concentration<sup>12</sup>.

Another study has reported that there was a significant improvement in the scores of memory test after both Cyclic meditation and Supine rest or the corpse posture (shavasana)<sup>9</sup> but the increment was more after CM compared to the SR<sup>9</sup>. Another study evaluated in the performance of children in verbal and spatial memory tests, there were two groups, one attending a yoga camp and the other a fine arts camp<sup>6</sup>. The yoga group showed

a significant increase of 43% in spatial memory scores (Multivariate analysis, Tukey test), while control groups showed no change. The results of the above study suggest that yoga practice, postures, yoga breathing, meditation improved delayed recall of spatial information<sup>6</sup>.

Another study showed that the students of yoga group performed better in academics. This study further concluded that low-stress students performed better than high-stress students, these results are similar to our study and proved that stress affects the students performance<sup>10</sup>.  
Review and literature

Memory can be encoded stored and retrieved. Encoding is the first stage in which we may put information from the world in the form of physical and chemical stimuli. second stage is the storage and third stage is retrieval. Yoga means union in Sanskrit. It is believed that Patanjali was the first to define yoga in third century BC. Different studies have shown that various yoga technique, meditation, pranayama and breathing techniques improve the immediate and spatial human memory. A study has shown that controlled right and left nostril breathing facilitates the performance on spatial and verbal scores<sup>5</sup>.

Another study, six letter cancellation tasks was done with 69 male subjects, ages 18 to 48 years. After the session they were assessed. The techniques used in



this study were cyclic meditation and supine rest. The results were shown that cyclic meditation brings about a greater improvement in performance in this task. which require selective attention, concentration, visual scanning abilities and respective motor response<sup>6</sup>. The results of the study on musician suggested that yoga and meditation may be beneficial as a routine practice to reduce performance anxiety in musicians<sup>7</sup>.

### Conclusion and Summary

This study was undertaken to evaluate the effects of pranayama on Memory performance. this study comprises of 62 healthy, physically active, young normal subjects having 42 male and 20 females. Memory level was assessed by using Wechsler Memory Scale after controlled breathing Pranayama for duration of 30 minutes daily for thirty days.

Previously a study shown the effects of unilateral forced nostril breathing on the intraocular pressures of eyes in 50 adults<sup>8</sup> in men, the forced breathing through both the right and left nostrils significantly decreased the intraocular pressures of both right and left eyes<sup>8</sup>.

The repeated measure ANOVA analysis revealed a significant increase in memory. This study concludes that yoga enhances numerical data retrieval mostly as a result of left-brain activation.

**Ethical Clearance:** This study was approved by institutional ethics committee.

**Source of Support:** Nil.

**Conflict of Interest:** None.

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# Lumbar Spondylolisthesis in a Sample of Iraqi Patients with Rheumatoid Arthritis

Nizar Abdulteef Jasim<sup>1</sup>, Zahraa Nizar Aday<sup>2</sup>, Al Derwibee Fadya A.<sup>3</sup>

<sup>1</sup>FIBMS (Intern. Med.), FIBMS, (Rheum. and Med. Rehab.), Consultant Rheumatologist and Internist, <sup>2</sup>DRMR (Diploma in Rheum. and Med. Rehab.), Baghdad University, College of Medicine, <sup>3</sup>FIBMS (Rheumatology and Medical Rehabilitation), University of Baghdad. Collage of Medicine, Medical City, Baghdad Teaching Hospital Baghdad, Iraq

## Abstract

The aim of the study is to assess the prevalence of lumbar spondylolisthesis in rheumatoid arthritis patients. A total of 100 patients with rheumatoid arthritis have been diagnosed according to the 2010 American College of Rheumatology/European League against rheumatism classification criteria, and compared with 100 healthy controls. Lumbar spondylolesthesis was reported in 27% of cases and 18% of controls. Males represented 19% of cases and 22% of control group while females represented 81 % of cases and 78% of controls. Among patients with spondylolesthesis, degenerative type was reported in(66.7%), while among controls with spondylolesthesis, the isthmic type was reported in (72.2%). The prevalence of lumbar spondylolesthesis in Rheumatoid arthritis patients with chronic low back pain was significantly higher than in controls. The prevalence of degenerative type was more common in rheumatoid arthritis patients, while the prevalence of isthmic type was more common in controls.

**Keywords:** Rheumatoid arthritis,disease activities indices, spondylolysis, spondylolesthesis.

## Introduction

Rheumatoid arthritis (RA) is a chronic systemic inflammatory disease characterized by synovial joints destruction leading to severe disability and premature mortality.<sup>(1)</sup> Rheumatoid arthritis affects approximately 0.5-1% of the population with female to male (3: 1 ratio), and in ages between 40 and 60 years. Approximately 70% of patients have irreversible joint destruction and 80% of active young adults in the labor market are affected by stiffness and devastating pain.<sup>(2)</sup> American College of Rheumatology (ACR)/European League Against Rheumatism (EULAR) developed classification criteria in 2010, which can help a physician-made diagnosis with a total score  $\geq 6$  points, is considered definite rheumatoid arthritis.<sup>(1)</sup> Various scoring indices have been used to quantify RA disease activity, including the Simple Disease Activity Index (SDAI), Clinical Disease Activity Index (CDAI), and Disease Activity Score (DAS). Although none of these is universally accepted as the “gold standard”, DAS has been increasingly used in clinical practice.

<sup>(3)</sup> Lumbar spondylolisthesis (LS) is the subluxation or slipping of one vertebral body relative to another. It is a potential cause of back pain and neurologic deficits.<sup>(10)</sup> Spondylolysis refers to a posterior defect in the vertebral body at the pars interarticularis. Usually, this defect is due to trauma or from chronic repetitive loading and hyperextension. If this instability results in translation of the vertebral body, spondylolisthesis occurs.<sup>(5)</sup> Certain genetic factors, such as family history, race and athletic activities that involve repetitive lumbar hyperextension have been associated with higher LS risk.<sup>(4,6)</sup> Isthmic spondylolisthesis (IS) is the most clinically encountered subtype and is seen with an incidence of 5-6% in the adult population and about 12% in the adolescent population. It commonly involves L5 (90%). Although the incidence of IS in women is half that of men, women account for >50% of symptomatic cases and have higher LS grades.<sup>(4)</sup> The incidence of degenerative spondylolisthesis (DS) is about 10% and is 3 to 9 times more common in women than men.<sup>(7)</sup> Hysterectomy and multi parity, presumably by causing abdominal muscle

deficiency, increase DS.<sup>(8)</sup> Grading of spondylolisthesis using Meyerding classification is determined by the percentage of slippage of the inferior-posterior corner of the vertebral body above over the superior surface of the vertebral body below. At least 5% slippage must be present for a diagnosis of SPL to be established.<sup>(9)</sup> Rheumatoid arthritis (RA) Generally spares the thoracic and lumbar portions of the spine. However, a review of literatures showed that rheumatoid synovitis with erosive changes can be developed in these diarthrodial joints. The vertebral bodies and intervertebral discs may be involved through either enthesitis or an extension of the inflammatory process from the apophyseal joints.<sup>(10)</sup>

### Subjects and Method

This is a case-control study conducted at Rheumatology unit of Baghdad Teaching Hospital/ Medical City, Baghdad, Iraq, from August 2018 to June 2019. A total of 100 patients with RA diagnosed according to the 2010 American College of Rheumatology/European League Against Rheumatism classification criteria for Rheumatoid arthritis, with a history of mechanical back pain for more than 3 months, were included in the study and compared with 100 controls.

#### Exclusion Criteria:

- Age less than 16 years.
- Backache of less than 3 months.
- History of trauma or history of spinal surgery.
- Malignancy.
- Pregnancy.
- Patients with inflammatory back pain.
- History of spondylodiscitis,
- History of systemic infection in the last 6 months requiring intravenous antibiotic.
- Osteoporosis or on anti osteoporotic treatment or with compressed vertebra or osteopenia on X-ray.
- RA patients overlapping with other autoimmune disease such as Systemic lupus erythematosus and inflammatory myopathy.

Data were collected using a data collection sheet containing questionnaires for the patients and controls. The questionnaires included demographic data, obstetric history, education, occupation, marital status

and smoking status. The three clinical disease activity indices, CDAI, SDAI and DAS28-(ESR, CRP), were calculated. All patients and control were evaluated for spondylolisthesis by lumbosacral x-ray in lateral view (flexion and extension position), and were taken by radiology institute device, Digital AGFA/DX-D400, made in Belgium in 2013. All X-rays were evaluated by a single radiologist who has been blinded to clinical data, using Meyerding classification. Grades were determined by the percentage of slippage of the inferior-posterior corner of the vertebral body above over the superior surface of the vertebral body below. Grade I is 5% to 25%, grade II is 26% to 50%, grade III is 51% to 75%, grade IV is 76% to 100%, and grade V is more than 100% (spondyloptosis).<sup>(9)</sup>

**Statistical Analysis:** Statistical Package for the Social Sciences (SPSS) version 23 was used for data entry and analysis. Mean and standard deviation were used to express the numerical data while frequency and percentages were used to express the categorical data. Appropriate tests, independent student t test, chi-square (Fischer exact test if not applicable), Anova test and logistic regression were used to confirm significance. P value  $\leq 0.05$  was considered significant.

### Result and Discussion

The mean age of RA patients was  $48.5 \pm 11.7$  SD years, of controls was  $49.1 \pm 15.4$  SD. Males represented 46.3% of RA patients and 53.7% of control group, while females represented 50.9% of patients and 49.1% of controls, and this difference was statistically non-significant ( $p=0.8$ ), (table 1). There was no significant association between duration of back pain and groups of study ( $p=0.2$ ). Leg pain and paresthesia were the most common symptoms reported in two groups. Sensory impairment was significantly higher in RA patients in comparison to controls ( $p=0.04$ ) as displaced in (table 2). Lumbar spondylolisthesis was significantly higher in RA patients in comparison to controls (27% vs. 18%),  $p=0.03$ . Anterolisthesis, degenerative type, was more in RA patients while retrolisthesis, isthmic type, was reported more with controls. L4-L5 and L5-S1 were the most commonly involved sites. Grade I & II spondylolisthesis were the most reported grades in both groups. Degenerative disc disease was the commonest other abnormal X-ray finding as illustrated in (table 3) and (figure 1). The rate of lumbar spondylolisthesis was higher among patients of 40-70 years old and  $\geq 70$  years but did not reach the significant level ( $p=0.4$ ). Lumbar

spondylolisthesis was significantly higher ( $p=0.02$ ) among female patients (29.6%) in comparison to male patients (15.8%). The rate of spondylolisthesis was significantly higher with patients who are at menopause phase as seen in (**table 4**). Spondylolisthesis status in term of present or absent were not significantly associated with RA duration, RF, ACPA, FC, RA disease activity indices, ESR level, and medications ( $p>0.05$ ). The only significant association was reported with CRP level in term of normal or high level and history of joint replacement surgery (hip or knee),  $p<0.05$ , (**table 5**). Female gender in RA patients, increased disease duration, activity, acute phase reactant and history of joint replacement surgery were considered potential risk factors that might significantly increases the probability of occurrence of spondylolisthesis ( $p<0.05$  for all) (**table 6**). QUEST-RA database that included 6,004 patients from 70 sites in 25 countries that found 79% of included RA patients were females, more than 90% of them were of Caucasians. <sup>(11)</sup>The increasing incidence of degenerative type in RA patients might be based on facet joint involvement and facet joint synovitis that increases the incidence of SPL among RA patients. <sup>(12)</sup> Three conditions have been reported as potential patho mechanisms of thoracic and lumbar spondylitis in patients with RA. First, synovitis probably starts in the apophyseal joints, with erosion of cartilage and subchondral bone in exactly the same fashion as in peripheral joints. Second, erosion of the facet joints produces functional incompetence, with resultant anteroposterior and lateral instabilities. Finally, the next lesion probably starts at the disco-vertebral junction as an enthesopathy with the inflammatory degeneration of collagen at the junction between the

discs and vertebral endplates, leading to a loss of disc space. <sup>(13)</sup> Hagege B et al observed that isthmic SPL (which is not affected by facet joint modifications) was less frequent in RA patients in comparison to controls, which suggests that facet joint is mainly involved in the pathophysiology of lumbar SPL in RA patients. <sup>(14)</sup> Neva MH et al concluded that the possible reason for the significant correlation between history of joint surgery and lumbar spondylolisthesis might be a history of poor control of RA disease activity and increased severity of joint destruction. <sup>(15)</sup> Because CRP level offers a measure of inflammation, a possible cause of the significant correlation between lumbar spondylolisthesis and serum CRP level is the inflammatory response in the lumbar spine. <sup>(16)</sup> Occurrence of lumbar spondylolisthesis in RA patients could associate with high disease activity or RA severity. <sup>(17)</sup> A large meta-analysis study evaluating the prevalence of cervical spine lesions in RA patients found that the incidence of atlanto-axial subluxation decreased over the time (ranging from 36% before 1980 to 24% before 2000) suggesting a role of a better management of RA due to improvement of therapies. <sup>(18)</sup> Spondylolysis together with spondylolisthesis (isthmic type) was reported in 9 cases (33.3%) of RA patients and 13 cases (72.2%) of control group. Micheli LJ et al were concluded that spondylolysis estimated to be present in 6-13% of the general population. Most, however, are asymptomatic. <sup>(19)</sup> Several previous studies indicated that degenerative changes of intervertebral discs or facet joint erosion were predictors of listhesis due to RA. <sup>(20)</sup> To the best of our knowledge, this is the first study in our country which demonstrates the relationship between lumbar spondylolisthesis and rheumatoid arthritis.

**Table 1. Socio demographic and obstetric history of females of both groups**

		Groups				p-value
		Patients		Control		
		No.	%	No.	%	
Age groups	<40	28	51.9%	26	48.1%	0.6
	40-70	47	47.9%	51	52.1%	
	≥70	25	52.1%	23	47.9%	
Gender	Male	19	46.3%	22	53.7%	0.8
	Female	81	50.9%	78	49.1%	
Educational level	Illiterate	24	37.5%	40	62.5%	0.06
	Primary	41	61.2%	26	38.8%	
	Secondary	23	63.9%	13	36.1%	
	College/Institute	12	36.4%	21	63.6%	

		Groups				p-value
		Patients		Control		
		No.	%	No.	%	
Occupation	Manual worker	80	58.8%	56	41.2%	0.01
	Non-manual worker	20	31.3%	44	68.8%	
Smoking	Yes	3	15.0%	17	85.0%	0.01
	No	97	53.9%	83	46.1%	
BMI (kg/m <sup>2</sup> )	Underweight	3	75.0%	1	25.0%	0.01
	Normal	11	23.4%	36	76.6%	
	Overweight	30	42.9%	40	57.1%	
	Obese	55	71%	23	29%	
Parity	Nil	13	43.3%	17	56.7%	0.2
	1-4	49	50.5%	48	49.5%	
	≥5(Grand multipara)	19	59.4%	13	40.6%	
Menstruation	Pre menopause	41	53.2%	36	46.8%	0.8
	Post menopause	40	48.8%	42	51.2%	
Hysterectomy	Yes	3	37.5%	5	62.5%	0.7
	No	78	51.7%	73	48.3%	

BMI; Body mass index, Kg; Kilogram, M2; square meter, P-value; Probability value.

**Table 2. Clinical findings of patients and control**

		RA	Control	P-value
Duration of back pain	3 months-1 year	9(42.9%)	12(57.1%)	0.2
	1-5 years	49(46.2%)	57(53.8%)	
	> 5 years	42(57.5%)	31(42.5%)	
Leg pain		80(80%)	89(89%)	0.07
Paresthesia		56(56%)	68(68%)	0.8
Neurogenic claudication		34(43%)	37(37%)	0.3
Sphincters' disturbances		10(10%)	4(4%)	0.9
Saddle anesthesia		4(4%)	4(4%)	1.0
Motor-abnormal		53(53%)	51(53%)	1.0
Sensory-abnormal		13(13%)	5(5%)	0.04
Reflexes-abnormal		9(9%)	3(3%)	0.07

RA; Rheumatoid arthritis, P-value; Probability value.

**Table 3. Spondylolisthesis characteristics of RA patients and control**

		RA	Control	P-value
Spondylolisthesis		27(27%)	18(18%)	0.03
Spondylolisthesis direction	Anterolisthesis	26(26%)	16(16%)	0.5
	Retrolisthesis	1(1%)	2(2%)	
Spondylolisthesis type	Isthmic	9(33.3%)	13(72.2%)	0.3
	Degenerative	18(66.7%)	5(27.8%)	

		RA	Control	P-value
Site	L4-L5	6(22.2%)	4(22.2%)	0.6
	L5-S1	21(77.8%)	14(77.8%)	
Grade	Grade 1	25(92.6%)	15(83.3)	0.7
	Grade 2	2(7.4%)	3(16.7%)	
Other X-ray findings	Normal	16(16%)	32(32%)	0.02
	Degenerative disc disease	33(33%)	34(34%)	
	Facet joint osteoarthritis	24(24%)	16(16%)	

RA; Rheumatoid Arthritis, P-value; Probability value, L; Lumbar, S; Sacral.

**Table 4. Spondylolisthesis rate according to socio demographic characteristics of RA patients**

		Spondylolisthesis				p-value
		Yes		No		
		No.	%	No.	%	
Age groups	<40	5	17.6%	23	82.4%	0.4
	40-70	14	29.8%	33	72.8%	
	≥70	8	32%	17	68%	
Gender	Male	3	15.8%	16	84.2%	0.02
	Female	24	29.6%	57	70.4%	
Educational level	Illiterate	7	29.2%	17	70.8%	0.6
	Primary	12	29.3%	29	70.7%	
	Secondary	4	17.4%	19	82.6%	
	College/Institute	4	33.3%	8	66.7%	
Occupation	Manual worker	20	25.0%	60	75.0%	0.3
	Non-manual worker	7	35.0%	13	65.0%	
Smoking	Yes	1	33.3%	2	66.7%	0.8
	No	26	26.8%	71	73.2%	
BMI (kg/m <sup>2</sup> )	Underweight	1	33.3%	2	66.7%	0.7
	Normal	4	36.4%	7	63.6%	
	Overweight	10	25.6%	29	74.4%	
	Obese	12	25.5%	35	74.5%	
Parity	Nil	3	23.1%	10	76.9%	0.6
	1-4	16	32.7%	33	67.3%	
	≥5	8	42.1%	11	57.9%	
Menopause	Pre menopause	6	17.6%	28	82.4%	0.01
	Post menopause	21	44.7%	26	55.3%	
Hysterectomy	Yes	1	4.1%	2	3.5%	0.3
	No	23	95.9%	55	96.5%	

No; Number, BMI; Body mass index, Kg; Kilogram, M<sup>2</sup>, square meter, P-value; Probability value.

**Table 5. Spondylolisthesis rate according to disease activity and used medications of RA patients**

		Spondylolisthesis		p-value
		Yes	No	
RA duration	<6 months	1(3.7%)	5(6.8%)	0.5
	≥6 months	96.3%)26	68(93.2%)	
RF Positive		21(77.7%)	56(76.7%)	0.9
ACPA positive		22(81.5%)	56(76.7%)	0.6
FC	I	12(44.4%)	45(61.6%)	0.2
	II	8(29.6%)	20(27.4%)	
	III	7(25.9%)	7(9.6%)	
	IV	0(0.0%)	1(3.7%)	
CDAI	Low	3(11.1%)	10(13.7%)	0.7
	Moderate	15(55.6%)	38(52.0%)	
	High	9(33.3%)	25(92.6%)	
SDAI	Low	2(7.4%)	11(15.1%)	0.6
	Moderate	16(59.3%)	42(57.5%)	
	High	9(33.3%)	20(27.4%)	
DAS28-ESR	Low	1(3.7%)	4(5.5%)	0.2
	Moderate	21(77.8%)	38(52.0)	
	High	5(18.5%)	31(42.5%)	
DAS28-CRP	Remission	0(0.0%)	2(2.8%)	0.6
	Low	1(3.7%)	5(6.8%)	
	Moderate	20(70.1%)	52(71.2%)	
	High	6(22.2%)	14(19.2%)	
ESR	Normal	7(25.9%)	33(45.2%)	0.1
	High	20(74.1%)	40(54.8%)	
CRP	Normal	6(22.3%)	37(50.9%)	0.02
	High	21(77.7%)	36(49.1%)	
NSAIDs	Used	7(25.9%)	28(38.4%)	0.7
Steroids (mean dose of prednisolone 6.6±3.2 mg)	Used	12(44.4%)	55(75.3%)	0.1
DMARDs (mean dose of MTX 20±11.2 mg))	Used	25(92.6%)	69(94.5%)	0.2
Biology	Used	19(70.4%)	57(78.1%)	0.6
Joint surgery	Yes	1(3.7%)	3(4.1%)	0.01

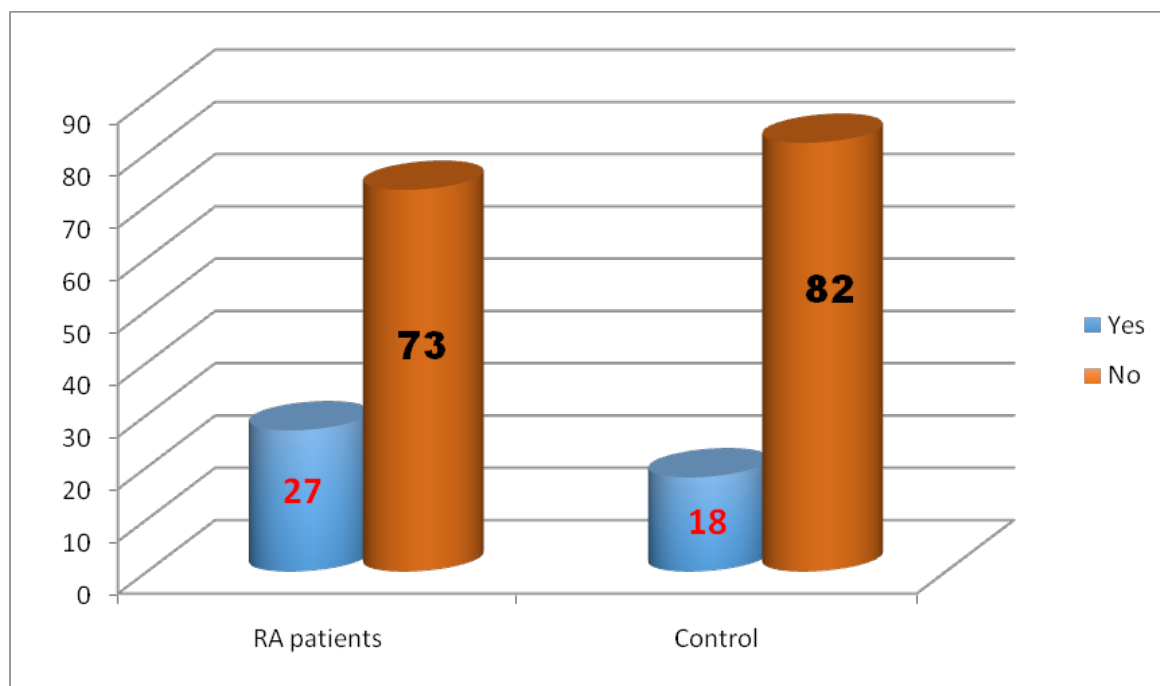
RA; Rheumatoid Arthritis, RF; Rheumatoid Factor, ACPA; Anti-citrullinated peptide antibody, FC; Functional class, CDAI; Clinical Disease Activity Index, SDAI; Simplified Disease Activity Index, DAS28-CRP; Disease Activity Score 28- C - reactive protein -DAS28-ESR; Disease Activity Score 28- Erythrocyte Sedimentation Rate, ESR; Erythrocyte Sedimentation Rate, CRP; C - reactive protein, NSAID; Non-Steroidal Anti Inflammatory Drugs, DMARD; Disease Modifying Anti Rheumatic Drugs, P-value; Probability value.

**Table 6. Logistic regression for spondylolisthesis in RA patients**

	OR	P-value	95% C.I. for OR	
			Lower	Upper
Age	0.9	0.5	0.8	1.2
Gender/female	6.3	0.01	2.4	9.8

	OR	P-value	95% C.I. for OR	
			Lower	Upper
RA Duration	3.6	0.04	1.9	4.07
CDAI moderate & high	4.7	0.02	2.8	7.8
SDAI moderate & high	3.9	0.03	2.4	6.2
DAS28ESR moderate & high	3.7	0.03	2.2	6.4
DAS28CRP moderate & high	3.8	0.03	2.1	5.8
ESR	4.2	0.02	1.8	6.8
CRP	4.8	0.01	2.7	6.6
Hysterectomy	1.1	0.4	1.0	5.4
Joint surgery	1.7	0.03	0.9	1.9

RA; Rheumatoid Arthritis, CDAI; Clinical Disease Activity Index, SDAI; Simplified Disease Activity Index, DAS28-CRP; Disease Activity Score 28- C - reactive protein, DAS28-ESR; Disease Activity Score 28- Erythrocyte Sedimentation Rate, ESR; Erythrocyte Sedimentation Rate, CRP; C - reactive protein, CI; Confidence interval, OR; Odds ratio.



**Figure 1. Prevalence of spondylolisthesis for RA patients and control**

**Conclusions**

Prevalence of lumbar SPL among rheumatoid arthritis patients with chronic low back pain was significantly higher than control group. Degenerative type of SPL was more common in RA patients while the isthmic type was more common in healthy controls.

**Limitations of the Study:**

1. Data collection had been done in one single institute.

2. Small sample size.

**Conflict of Interest:** Nil.

**Source of Funding:** Self-funding.

**Ethical Clearance:** Consent was obtained from each participant included in this study according to the declaration of Helsinki. Ethical approval was obtained from the Ethics Committee in Medical Department, College of Medicine, Baghdad University.



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# Determinants of Maternal Mortality: In a Tertiary Care Hospital of Central India

Priyanka Tiwari<sup>1</sup>, Jagrati Kiran Nagar<sup>2</sup>, Ravikant Arjariya<sup>3</sup>, Shikha Pandey<sup>4</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>Associate Professor, <sup>4</sup>Professor, Department of Obstetrics & Gynaecology, BMC, Sagar, M.P., <sup>3</sup>Associate Professor, Department of Physiology, BMC, Sagar, M.P.

## Abstract

**Introduction:** Maternal mortality is unacceptably high. About 295 000 women died during and following pregnancy and childbirth in 2017. The vast majority of these deaths (94%) occurred in low-resource settings, and most could have been prevented. Women face high risk of maternal deaths in south Asia and sub Saharan Africa<sup>(1)</sup>

**Aims and Objective:** To identify causes of maternal deaths in a tertiary care hospital.

**Materials and Method:** This is a retrospective study conducted in a tertiary level hospital of Bundelkhand Medical College Sagar M.P. in central India. A retrospective case record examined related to maternal mortality in hospital setting. Ethical approval was obtained from Institutional ethical committee.

Data was collected in predesigned proforma.

Data were analyzed for age, gravidity, trimester of pregnancy, duration of deaths and causes of death.

**Results:** During 1<sup>st</sup> January 2018 to 31 December 2019, 44 maternal deaths amongst 11944 live births occurred in obstetrics department of Bundelkhand Medical College Sagar M.P. India.

Most no. of deaths occurs in age between 21-30 years (86.4%) followed by 31-40 years (6.8%).

The maternal mortality ratio (MMR) stood at 368 per lac live births. 31% were primigravida.

The leading causes of death were Pre-eclampsia & Eclampsia (34%), Severe Anaemia (20%) and Hepatic encephalopathy (13%).

**Conclusions:** Based on the results we found that hypertensive disorder (Pre-eclampsia & Eclampsia) is an important cause of maternal mortality followed by Severe Anaemia, Hepatic encephalopathy, Septic abortion and postpartum haemorrhage.

Maternal mortality is a reflection of the standards of obstetric service and quality of healthcare. The audit of such mortality would help in identifying the problems and prevent recurrence by taking appropriate measures.

Hence the present study was conducted at tertiary care hospital to review the maternal deaths and causes of maternal mortality.

**Keywords:** Maternal Mortality, Eclampsia, Maternal Mortality Ratio, Post Partum Hemorrhage.

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## Corresponding Author:

**Dr. Ravikant Arjariya**

Associate Professor, Department of Physiology, BMC, Sagar, M.P., H.No. 2, Type III, Block 'A' Residential complex, BMC Sagar, M.P. 470001  
e-mail: arjariyaravikant@gmail.com  
Mob.: 7898573595

## Introduction

Maternal death or maternal mortality is defined by the World Health Organization (WHO) as "The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the

pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental cause<sup>(2,3)</sup>.

Adding to the WHO definition, the CDC extends the period of consideration to include up to 1 year within the end of a pregnancy regardless of the outcome<sup>(4)</sup>.

There are two performance indicators that are sometimes used interchangeably: maternal mortality ratio and maternal mortality rate, which confusingly both are, abbreviated “MMR”<sup>(5)</sup>.

By 2017, the world maternal mortality rate had declined 44% since 1990, but still every day 830 women die from pregnancy or childbirth related causes. According to the United Nations Population Fund (UNFPA) 2017 report, this is equivalent to “about one woman every two minutes and most of these deaths and injuries are entirely preventable.

Although attempts have been made in reducing maternal mortality, there is much room for improvement. Over 85% of maternal deaths are from impoverished communities in Africa and Asia. The effect of a mother’s death results in vulnerable families. Their infants, if they survive childbirth, are more likely to die before reaching their second birthday<sup>(6)</sup>.

In the context of the Sustainable Development Goals (SDG), countries have united behind a new target to accelerate the decline of maternal mortality by 2030. SDG 3 includes an ambitious target: “reducing the global MMR to less than 70 per 100 000 births, with no country having a maternal mortality rate of more than twice the global average”.

According to the Sample registration system, Registrar General of India (November 2019), Maternal mortality ratio of India is 122 per 1 lakh live births and MMR of Madhya Pradesh is 188 per 1 lakh live births<sup>(7)</sup>

In present study MMR was 368 per 100000 live births. High MMR revealed in present study may be due to the fact that in our study place was a tertiary care centre and referral centre so un-booked obstetric cases were referred here in emergency for management.

## Materials and Method

Ethics approval to conduct the study was obtained from the Institutional Ethics Committee.

A retrospective study was conducted in Bundelkhand Medical College and associated hospitals Sagar M.P. which is a tertiary care hospital in the Bundelkhand region of central India in which a review of all maternal deaths which occurred over a two-year period (January 2018 to December 2019) was done.

The hospital maternal death register was used to identify and collect a list of maternal deaths that occurred during the study period. Medical records of maternal deaths were reviewed. Information on all the cases was extracted from the patient’s case notes and maternal mortality records. The total deliveries and live births for each year were obtained from the delivery registers.

The confidentiality of the patient’s personal information was protected.

The data collected included maternal age, gestation age, referring facility, date of admission, date of death and cause of death. Data was captured and analyzed using Microsoft Excel and Descriptive statistics was used to analyses data. Categorical variables are displayed as percentages.

## Observations and Results:

During 1<sup>st</sup> January 2018 to 31 December 2019, 44 maternal deaths amongst 11944 deliveries occurred in obstetrics department of Bundelkhand Medical College Sagar M.P. India.

The maternal mortality ratio (MMR) stood at 368 per lac live births.

**Table No. 1: Age distribution of maternal deaths.**

S.No.	Age (in years)	No. of Deaths	% of Deaths
1	<20	2	4.5 %
2	21-30	38	86.4 %
3	31-40	3	6.8 %
4	>40	1	2.3 %
		Total = 44	100%

Most no. of deaths occurs in age between 21-30 years (86.4%) followed by 31-40 years (6.8%).

**Table No. 2: Case characteristics of reviewed maternal death**

S.No.	Reason for admission	Number of Deaths	% of Deaths
1	Routine labour	1	2.27%
2	Obstetrics complication and also in labour	5	11.36%
3	Obstetrics complication not in labour	26	59.09%
4	Complication post partum	12	27.28%
		Total = 44	100%

Most no. of deaths occurs due to obstetrics complication not in labour 26 (59.09%) followed by deaths occurs due to complication post partum 12 (27.28%).

**Table No. 3: Referral from another health facility**

S.No.	Referral from another health facility (Yes/No)	No. of Deaths	% of Deaths
1	Yes	24	55%
2	No	20	45%

Higher rate of death found in patients referred from other health facility (55%).

**Table No. 4: Pregnancy stage at the time of death**

S.No.	Pregnancy stage	No. of Deaths	% of Deaths
1	During pregnancy	20	45.5%
2	During labour	1	2.3%
3	Postnatal-Vaginal delivery	14	31.8%
4	Postnatal- LSCS	6	13.6%
5	Post abortion	3	6.8%

Most of women died during pregnancy (44.5%), followed by death during postnatal –vaginal delivery (31.8%).

**Table No. 5: Time from admission to death**

S.No.	Time from admission to death	No. of Deaths	% of Deaths
1	0 - 6 hrs	15	34%
2	7-12 hrs	11	25%
3	13-24 hrs	5	11.4%
4	25-48 hrs	10	22.8%
5	>48 hrs	3	6.8%
		Total=44	100%

Most of women died during 0-6 hrs of delivery (34%), followed by time between 7-12 hours of delivery (25%).

**Table No. 6: Causes of deaths**

S.No.	Cause of Deaths	No. of Deaths	% of Deaths
1	Pre-eclampsia & Eclampsia	15	34 %
2	Severe Anaemia	9	20 %
3	Hepatic encephalopathy	6	13 %
4	Septic abortion	5	11 %
5	PPH	4	9 %
6	Pulmonary oedema	2	4.5 %
7	Ruptured uterus	1	2.3 %
8	Septicemia	1	2.3 %
9	Ante partum hemorrhage	1	2.3 %

The leading causes of death in descending order are Pre-eclampsia & Eclampsia (34%), Severe Anaemia (20%), Hepatic encephalopathy (13 %), Septic abortion (11%), & PPH ((9 %).

## DISCUSSION

In the present study, there were 44 maternal deaths amongst 11944 deliveries occurred in obstetrics department of Bundelkhand Medical College Sagar M.P. India. The Maternal Mortality Ratio (MMR) stood at 368 per lac live births.

High MMR revealed in present study may be due to the fact that in our study place was a tertiary care centre and referral centre so un-booked obstetric cases were referred here in emergency for management, delayed referrals and moribund patients at the time of admission inflated the maternal deaths.

Our observations correlate with other studies in where the maternal mortality ratio ranged between 113 to 1000<sup>(8,9,10,11,12,13)</sup>.

In the present study, 86.4 % deaths were in age group 21-30 and 4.5 % deaths were due to teenage pregnancies, 6.8 % deaths in mothers above 30 years.

These findings correlate with other studies; Dr Sandhya Gupta et al reported 74.3 % maternal death occurred in the age group of 21-30 years, <sup>(8)</sup>

K. V. S. M. Sandhya Devi et al. reported maternal death 48.45% were in the age group of 21-25 years.

Teenage pregnancies constituted about 17.53%. Maternal deaths in age group above 25 years were 34.02%.<sup>(9)</sup>

Vidyadhar et. al. reported 55.2% deaths in age group 19-24, 15.79 % deaths in < 19 years<sup>(14)</sup>

Saini and Gupta, et. al. reported 81.69% deaths in age group 21-30 years.<sup>(15)</sup>

Nishupriya et. al. reported 74.22% deaths in 21 -30 years.<sup>(16)</sup>

Yadav K et. al. reported 72.68% deaths among 20-29 years.<sup>(17)</sup>

Purialka et. al. showed 71.53% of deaths occurred in 21-30 years age group.<sup>(18)</sup>

In this study, 52.2% deaths occurred in the post natal period followed by 47.2% deaths in the antenatal period.

Similar results have been obtained in other studies; Purandare et al, showed 73.33% deaths occurred in postpartum period and 26.66% in antenatal period; (13)

Saini and Gupta, et. al. reported 66.1% of post natal deaths; (15)

Nishupriya et. al, showed 62.8% postpartum deaths. (16)

Yadav K et. al. reported 72.16% post natal deaths; (17)

Purialka et. al, showed 63.08% of deaths in postnatal period. (18)

In the present study, 34% deaths occurred within 0-6 hours of admission, 70.4% deaths occurred within 24 hrs of admission, 20.8% deaths within 48-78 hrs of admission.

Our observations correlate with other studies, K. V. S. M. Sandhya Devi et al. reported 29.9% deaths occurred within <12 hours of admission, 48.45% deaths occurred within 24 hrs of admission, 27.83% deaths within 1-3 days, (9)

Saini and Gupta, et al. Reported 42.85% deaths within 24 hours of admission and 57.15% after 24 hours; (15)

Nishupriya et. al, showed that 54.63% of deaths were within 24 hours of admission, 19.58% within 25-48 hours 10.30% within 49-72 hours and 15.46% after 72 hours of admission; (16)

Purialka et. al, reported 45% of deaths within 24 hours of admission. (18)

In the present study leading causes being hypertensive disorders 34% (Pre-eclampsia & Eclampsia), Severe Anaemia (20 %), Hepatic encephalopathy (13 %), Septic abortion (11 %), & PPH (9%).

Our observations correlate with other studies, Dr Sandhya Gupta et al reported the most common cause of maternal death in their study was hypertensive disorders of pregnancy, which is more common in primi patients (8)

K. V. S. M. Sandhya Devi et al. reported leading causes being haemorrhage 27.4%, hypertensive disorders 23.71% (Eclampsia and severe preeclampsia) (9)

Purandare et. al, observed 70.83% deaths due to haemorrhage, 13.3% due to hypertension and 3.3% deaths due to sepsis. (13)

Vidyadhar et. al, reported 21.05% deaths due to haemorrhage, 10.52% deaths due to eclampsia and pulmonary embolism and 7.89% due to sepsis, 13.15% deaths due to heart disease and anaemia as cause in only 2.63% of deaths. (14)

In Saini and Gupta et. al. study, 60.5% were direct deaths among which 23.9% were due to haemorrhage 21.1% due to sepsis and 7% due to eclampsia and 39.43% were indirect causes of death; (15)

Nishupriya et. al, showed postpartum haemorrhage 35.05% as the leading cause followed by hypertensive disorders 27.83% and anaemia 25.7%; (16)

Yadav k et. al, reported 73.19% as direct obstetric deaths of which haemorrhage 43.16%, hypertension 33.09%, sepsis 12.67%, 26.8% were indirect cause with anaemia as leading cause; (17)

Purialka, et. al. Reported sepsis 43.05% as leading cause followed by haemorrhage and eclampsia 22.22% and 31.94% respectively. (18)

**Study Limitations:** As with retrospective studies, any missing data from patient files affects the reliability of the data, but this was minimized by reviewing admission and death registers and all files from the records department. Additionally, the recorded causes of death were based on a clinical assessment of the attending medical doctors.

## Conclusions

Based on the results we found that hypertensive disorder (Pre-eclampsia & Eclampsia) is an important cause of maternal mortality followed by Severe anaemia, Hepatic encephalopathy, Septic abortion and Postpartum haemorrhage.

Many developing nations lack adequate health care, family planning and pregnant women have minimal access to skilled labour and emergency care interventions such as antibiotics, oxytocics, anticonvulsant, manual removal of placenta and instrumental vaginal delivery are vital to improve the chance of survival.

Maternal mortality is a reflection of the standards of obstetric service and quality of healthcare. The audit of such mortality would help in identifying the problems and prevent recurrence by taking appropriate measures. Hence the present study was conducted at tertiary care hospital to review the maternal deaths and causes of maternal mortality.

Maternal health and newborn health are closely linked. It is particularly important that all births are attended by skilled health professionals, as timely management and treatment can make the difference between life and death for the mother as well as for the baby.

To improve maternal health, barriers that limit access to quality maternal health services must be identified and addressed at both health system and society levels.

**Ethical Clearance:** Yes

**Financial Interest:** None

**Conflict of Interest:** None

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# Prostaglandin E2 Levels in the Evaluation of Management of Osteoarthritis Using Pulsed Electromagnetic Field: An Interventional Study

Sajuni I.<sup>1</sup>, Karthika M.<sup>1</sup>, Sujatha B.<sup>2</sup>, Anbarasi R.<sup>1</sup>, S. Vishnuprasaath<sup>3</sup>, Vijayalakshmi B.<sup>4</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>Professor and Head, Department of Physiology, Government Pudukkottai Medical College & Hospital, Pudukkottai, <sup>3</sup>Tutor, ESIC Medical College, K.K. Nagar, Chennai, <sup>4</sup>Professor & Head, Department of Physiology, Saveetha Medical College & Hospital, Thandalam, Chennai

## Abstract

Knee pain is one of the most frequent musculoskeletal problems among the middle-aged and elderly people and 'Osteoarthritis' is the widespread clinical pathology of the knee.

**Objective:** The present study was conducted to evaluate whether low frequency Pulsed Electro Magnetic Field (PEMF) therapy is effective in patients with osteoarthritis knee using surface Electromyography (sEMG) of vastusmedialis.

**Method:** The participants were subjected to Pulsed Electromagnetic Field Therapy using the PULSATRON instrument designed by Madras Institute of Magnetobiology, Anna nagar. They were given PEMF therapy of 10Hz for 60 minutes/day for 21 days with a break after every 6 days. Serum PGE2 levels are measured by invitro ELISA method. Serum Prostaglandin E2 levels are estimated before and after PEMF therapy.

**Results:** The study shows that Low frequency PEMF (10 Hz) can be used as a treatment modality for Osteoarthritis. PEMF therapy, when given for a sufficient time (21 days) has shown to reduce the inflammation by decreasing the levels of the inflammatory marker Prostaglandin E2. Serum PGE2 levels were found to be significantly decreased ( $p < 0.001$ ) in the study group following the Pulsed Electro Magnetic Field (PEMF) therapy.

**Keywords:** Low frequency PEMF, Serum PGE2.

## Introduction

Osteoarthritis causes degradation of joints, articular cartilage and subchondral bone<sup>1</sup>. About 40% of the elderly Indian Population suffer from osteoarthritis, 2% among them experience crucial pain and disability.<sup>2</sup> Females are affected more severely with osteoarthritis with more number of joints involved particularly the knee

and hand.<sup>3</sup> Osteoarthritis is broadly classified into two main categories – Primary osteoarthritis and Secondary osteoarthritis.<sup>4</sup> The Primary form of osteoarthritis occurs due to an idiopathic etiology. The secondary forms of osteoarthritis occur as a consequence of some underlying pathology. The common etiologies include: Congenital, Post surgery, injury, Endocrine, Metabolic, Rheumatologic and Neurological.

Patients of osteoarthritis knee present with knee pain, stiffness, swelling of the joint, cracking with joint movement and decreased function of the joint. A longstanding osteoarthritis knee left untreated leads to severe functional disability. The limitations are due to the cartilage defect, erosion and fusion of the joint and muscle stiffness. Most of the treatments at present are

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### Corresponding Author:

**Dr. Karthika M.**

Assistant Professor, Department of Physiology,  
Dhanalakshmi Srinivasan Medical College & Hospital,  
Perambalur



aimed at pain reduction, improving the joint stiffness and maintenance of joint function.

Inflammation is the defense mechanism of the body in response to the injury involved in Osteoarthritis. It is an advantageous event which results in elimination of pathogenic factors and restoration of normal function of the tissues. The failure of the acute phase of inflammation to terminate the deterioration will progress to chronic inflammation and tissue damage.<sup>5</sup> The inflammatory mediator PGE<sub>2</sub> is responsible for all three established signs of inflammation – redness, swelling and pain. Redness and edema are due to the fact of increased blood supply to the inflamed tissue produced by the local arteriolar dilatation. Pain results from the action of PGE<sub>2</sub> on the sensory neurons at the peripheral and central sites.<sup>6</sup>

Pulsed Electromagnetic Field (PEMF) is a modern therapeutic device used in treating many clinical conditions. Though the clinical application of PEMF is still under controversy, it is being widely used as a treatment modality over the past two decades and has shown to decrease pain, inflammation and stiffness in patients with osteoarthritis.<sup>7</sup> The mechanism behind this is the increase in blood supply to peri-articular compartment due to synthesis of nitric oxide.<sup>8</sup>

This study focuses on evaluating whether the low frequency and low-intensity Pulsed Electromagnetic Field (PEMF) therapy is effective in osteoarthritis by assessment of inflammation by estimating the level of Prostaglandin PGE<sub>2</sub> before and after administration of Pulsed Electro Magnetic Field Therapy.

### Materials and Method

An interventional study was conducted in the Institute of Physiology and Experimental Medicine, Madras Medical College in collaboration with the Institute of Geriatrics, Rajiv Gandhi Government General Hospital, Chennai from April 2015 to March 2016. Fifty patients between 50 to 70 years of age with osteoarthritis knee having symptoms for at least one year duration were included in the study after obtaining Ethical approval from Institutional Ethics Committee (IEC), Madras Medical College, Chennai. Patients with chronic disorders were excluded from the study.

**Methodology:** The participants were subjected to Pulsed Electromagnetic Field Therapy using the PULSATRON instrument designed by Madras Institute of Magnetobiology, Anna nagar. They were given PEMF therapy of 10Hz for 60 minutes/day for 21 days with a break after every 6 days (protocol designed by Madras Institute of Magnetobiology). Blood samples are collected under strict aseptic precautions by venepuncture of antecubital vein and serum is separated by centrifugation. Serum PGE<sub>2</sub> levels are measured by invitro ELISA method. Serum Prostaglandin E<sub>2</sub> levels were estimated before and after PEMF therapy.

**Statistical Analysis:** After collection, data were checked for consistency and completeness. Then the data was entered in database Statistical Package for the Social Sciences (SPSS) software version 21. The Paired Student's t test was carried out to compare the mean of variables before and after administration of Pulsed Electro Magnetic Field therapy.

### Results

The present study was done to evaluate whether low frequency Pulsed Electro Magnetic Field (PEMF) therapy is effective in patients with osteoarthritis knee by estimating the level of Prostaglandin PGE<sub>2</sub> before and after administration of Pulsed Electro Magnetic Field Therapy.

**Table 1: Baseline Parameters**

S.No.	Variable	Mean±SD
1.	Age (in years)	62.08±4.36
2.	Duration of osteoarthritis (in years)	3.46±1.53
3.	BMI	27.57±2.59

The mean age of the individuals included in the present study was 62.08 ± 4.36 years with the 50 to 70 years. The mean duration of symptoms of osteoarthritis in study subjects was 3.46± 1.53 years. The average BMI was found to be 27.57 ± 2.59.

Blood samples are collected under strict aseptic precautions by means of venepuncture of antecubital vein and serum is separated by centrifugation. Serum PGE<sub>2</sub> levels are measured by invitro ELISA method. Serum Prostaglandin E<sub>2</sub> levels were estimated before and after PEMF therapy.

**Table 2: Comparison of mean values of the of PGE2 levels before and after PEMF therapy**

Variable	Group	N	Mean	SD	P –Value
Prostaglandin E2 levels	Before PEMF	50	471.16	104.94	<0.001***
	After PEMF	50	290.65	74.14	

\*\*\* P – Value < 0.001 Very Highly Significant

Table 2 shows that the Serum PGE2 levels were found to be significantly decreased ( $p < 0.001$ ) in the study group following the Pulsed Electro Magnetic Field (PEMF) therapy.

### Discussion

The present study revealed that Low frequency PEMF (10 Hz) can be used as a treatment modality for Osteoarthritis, when given for a sufficient time (21 days). Similar results are shown by various studies found in the literature. Finietal stated that PEMF being applied at 75Hz, 1.6mT, 6hrs perday for three months proved to prevent the development of osteoarthritis in aged guinea pigs.<sup>9</sup> Aaronand Ciomboretal examined the effects of PEMF in a decalcified bone matrix. The observations were noted with the increase in matrix synthesis which is stimulated by the proliferation of mesenchymal cells.<sup>10</sup> Ciombor et al had proved the enhanced synthesis of cartilage under the effect of themagnetic field applied at a burst of 4.5ms duration and further repeated at 15 bursts.<sup>11</sup> De Mattei et al observed the anabolic effects of PEMF in the cartilage at different ranges of exposure length (1,4,9 and 24 h), different frequencies (2, 37,75 and 110 Hz) and magnitudes (0.5, 1, 1.5, 2mT).<sup>12</sup>

Although the osteoarthritis is a non- inflammatory disease, various cytokines, prostaglandins and reactive oxygen species are believed to play important roles in pathogenesis.<sup>13</sup> The degenerative actions of PGE2 on the chondrocytes are exerted through the EP4 receptor which activates the enzyme adenylycyclase through G proteins resulting in the accumulation of intracellular cyclic adenosine monophosphate.<sup>14</sup> Lawand et al stated that Pain in osteoarthritis is contributed mainly by factors like increase in inflammation occurring at early stages of arthritis and destruction of articular cartilage.<sup>15</sup> The genetic studies conducted by Sato et al proved that there was an elevation in the expression of the terminal synthase microsomal prostaglandin synthase (mPGEs) which was essentialfor the COX-2 derived PGE2 production in the diseased cartilage.<sup>16</sup> PGE2 induced *pain reduction was*

*seen* during magnetic field exposure by modulating the exogenous and endogenous opioid systems in a study conducted by M.Kavaliers et al.<sup>17</sup> Senthil Kumar V et al observed a decrease in lysosomalactivities in arthritis rats on exposure to PEMF.<sup>18</sup> Studies done by Chang et al noticed a reduction in levels of TNF- $\alpha$  and IL-6 in ovariectomised rats which were exposed to PEMF for 7 days with different intensities of electric field.<sup>19</sup>

### Conclusion

The study shows that Low frequency PEMF (10 Hz) can be used as a treatment modality for Osteoarthritis. PEMF therapy, when given for a sufficient time (21 days) has shown to reduce the inflammation by decreasing the levels of the inflammatory marker, Prostaglandin E2. Hence, PEMF, a novel approach, can be used in treating chronic osteoarthritis knee adjunctive to the pharmacotherapies that are currently in use.

**Limitation of the study:** Further studies including a large number of diabetic and hypertensive participants and assessment of the efficacy of PEMF therapy by other markers of the disease should be done.

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# Sources and Severity of Stress in Various Domains among First Year Medical Students and its Relationship with their Academic Performance: A Cross Sectional Study

Samiksha Goyal<sup>1</sup>, Farah Khaliq<sup>2</sup>

<sup>1</sup>MBBS Student, UCMS & GTB Hospital, Delhi University, Delhi, <sup>2</sup>MD, PhD. Professor, Department of Physiology, UCMS & GTB, Hospital, Delhi University, Delhi

## Abstract

**Background:** First year medical students are the most vulnerable group to experience stress in their new environment in the field of medicine. The present study evaluated perceived stress among them along with its correlation with academic performance.

**Method:** An Indian adaptation of the Medical Student Stressor Questionnaire (MSSQ) was used to determine the effect of stress on the academic performance of students. Responses were correlated with their respective 1st professional exam marks.

**Results:** Stress due to examinations was reported by 24.5% students and due to excess syllabus by 33%. Some students (11.8%) experienced severe stress due to relationship issues, due to unjustified grading process (10.4%) and health issues. Females had more academic and group activity related stress as compared to males. The students who participated in sports or cultural societies had higher Drive and Desire related stress levels in contrast to the non-participants. The interpersonal & intrapersonal related stress (IRS score) of students was negatively correlated with their academic performance. The increased stress among female participants was related to an improved academic performance in them.

**Conclusions:** Too much stress negatively interfered with student's preparation, concentration and performance while positive stress helped student achieve peak performance.

**Keywords:** Stress, Medical students, Academic performance, MSSQ, Academic related stressors.

## Introduction:

Stress is a process by which we perceive and cope with environmental threats and challenges.<sup>[1]</sup> Medicine is one of the most desired careers among students, but along with its pros comes a tremendous amount of challenges and stress that one has to deal with. Persistent

stressful conditions are reported to be associated with mental and physical health problems in medical students at various stages of their training.<sup>[2-7]</sup> This may lead to conditions of anxiety, depression, alcoholism and drug abuse, ultimately ruining one's career and social life. The worst case scenario for a medico is to end his life by committing suicide. Various statistics have revealed that in India, every hour, one student commits suicide and a major proportion of such humiliating cases are of medical students. As a result, it is of great importance to control this alarming situation since the nation's future is on stake.

According to the first model of stress published by Hans Selye,<sup>[8]</sup> stress can be divided into eustress and distress. The stress which enhances function (Physical or

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## Corresponding Author:

**Dr. Farah Khaliq**

Department of Physiology, UCMS & GTB Hospital,  
Dilshad Garden, Delhi, India 110095

Phone No.: 9811907770

e-mail: farahphysioucms@gmail.com

mental, such as through strength training or challenging work) is called eustress, while persistent stress that is not resolved through coping or adaptation and may lead to anxiety or withdrawal (depression) behaviour is known as distress.

First year medical students are the most vulnerable group to experience stress in their new environment in the field of medicine. This year of medical school imparts a great transition in the lives of students. Students from varied cultural and socioeconomic strata get admitted in Government medical colleges of India. These students in addition to bearing the burden of vast medical syllabus, face social, emotional and family problems. All these factors affect their learning ability and academic performance.<sup>[9-12]</sup> Most of the stress assessment studies in medical students focus either only on academic stressors or just predict the generalised stress levels among students. Therefore it is essential to analyse the degree of stress in all the domains in Indian medical students. We hypothesize that analyzing stress levels among medical students would prove to be a predictor of their academic performance.

The present cross sectional study was thus planned to assess the sources and severity of stress in various domains among first year medical students. Considering that stress can either negatively or positively influence academic achievements, it also explores the relationship between stress and academic performance among medical students.

## Methodology

**Setting and participants:** Study was conducted in the Department of Physiology at our institute (Name concealed as per instructions). As this study is focussed on first year medical students, sample size was not calculated. A batch of 150 students admitted in 2018 for MBBS course in our college were invited to participate in this study. Of these 106 students willingly consented and hence were the participants of this study which was conducted within the college premises. During this one year these students study basic subjects i.e. Anatomy, Physiology and Biochemistry. At the end of first academic year the students appear for their professional examinations, held by Delhi University, to qualify for the next academic year.

**Study Design:** This cross sectional study was approved from Institutional Ethics Committee-Human Research (IEC-HR No 2019/39/4) of UCMS. All the

first year MBBS trainees were invited for the study and their participation was completely voluntary. A written informed consent was obtained from all the participants.

**Work plan:** The Questionnaire was self administered to the 1st year MBBS students before their first professional examination and then the responses were correlated with 1st professional exam marks.

**Questionnaire:** For the present study, the Medical Student Stressor Questionnaire (MSSQ) was used to determine the effect of stress on the academic performance of students.<sup>[13]</sup> It is a valid and reliable instrument which consisted of 25 items representing six stressor domains:

1. Academic related stressors (ARS)
2. Intrapersonal and interpersonal related stressors (IRS)
3. Teaching and learning-related stressors (TLRS)
4. Social related stressors (SRS)
5. Drive and desire related stressors (DRS)
6. Group activities related stressors (GARS)

These six domains are the basic stressors identified for medical students by various researches. Respondents were asked to rate each source by choosing from five responses ranging from Causing no stress at all to Causing severe stress. The scoring method assigns marks from zero (i.e. causing no stress) to four (i.e. causing severe stress) to each of the responses respectively.

The data obtained from the survey was processed and then correlated with the student's respective academic performances.

**Academic performance:** Academic performance was measured from the total score of first professional marks available online after the declaration of University exam (final) result. The total university examination score (marks) was out of 600. The possible range of examination score could have been from 0 to 600.

**Statistical Analysis:** The data was analysed using Statistical Package for Social Sciences (SPSS) 20.0 for Windows (SPSS, Inc., Chicago, IL, USA). Percentage frequency of occurrence for different grades of stress levels in each domain was calculated. Unpaired t-test was used to compare means of continuous variables and results were reported as mean (M)  $\pm$  standard deviation

(SD). Non parametric data was analysed by Mann Whitney test. Pearson's coefficient analysis was used for correlating the level of stress with individual academic performance.. A p-value < 0.05 was considered as significant.

## Results

A cross sectional study was conducted on 106 first year MBBS students of Batch 2018 in University College of Medical Sciences. The data was then collected and analysed using SPSS software.

Table 1 presents percentage of students experiencing different grades of stress levels (ranging from no stress at all to severe stress) in academic domains of the MSSQ i.e. Academic Related Stressors (ARS) and Teaching and Learning Related Stressors (TLRS). According

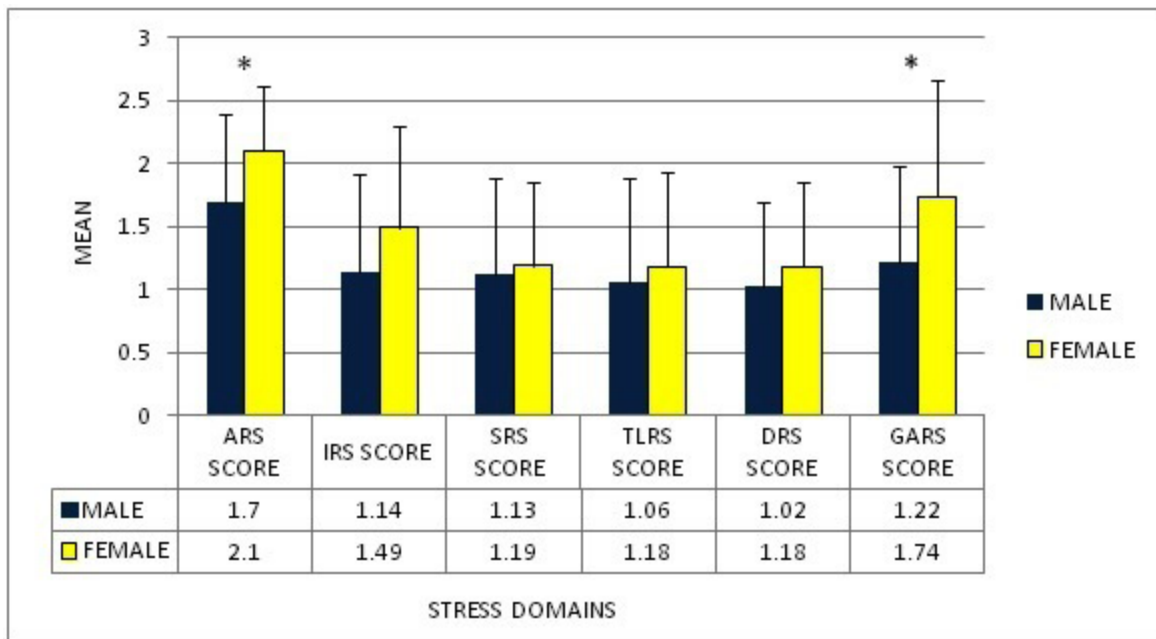
to Table 1 and 2, 24.5% students reported high stress due to examinations and 33% due to excess syllabus. 11.8% of students experienced severe stress related to relationship issues which is a social related stressor. This was followed by, 10.4% of students who experienced severe stress due to unjustified grading process (an academic related stressor). A similar comparison was done for the non academic domains of the MSSQ i.e. IRS, SRS GARS and DRS. About 10.4% of students experienced severe stress due to health issues such as headache/sleep/fatigue which falls in the domain of Interpersonal and Intrapersonal related stressors. While mild stress was reported on other parameters like feeling of incompetence, lack of time for family and friends, hesitation in communication, language problems and peer pressure.

**Table 1: Percentage of students experiencing different grades of stress levels in academic domains of the MSSQ**

	Causing no stress at all	Causing mild stress	Causing moderate stress	Causing high stress	Causing severe stress
<b>Academic Related Stressors</b>					
Tests/Examinations	3.80%	24.50%	40.60%	24.50%	6.60%
need to do well (self expectation)	7.50%	29.20%	36.80%	17.90%	8.50%
Heavy workload/Excess syllabus	2.90%	15.10%	39.60%	33%	9.40%
Difficulty in understanding content (books/ lectures)	21.70%	42.50%	25.50%	6.60%	3.80%
Falling behind in reading schedule	7.50%	34.90%	37.70%	15.10%	4.80%
Unjustified grading process	22.60%	30.20%	28.30%	8.50%	10.40%
<b>Teaching/Learning Related Stressor</b>					
Lack of guidance from teachers/lack of teaching skills	32.10%	39.60%	17.90%	7.50%	2.90%
Lack of recognition for work done	32.10%	37.70%	23.60%	6%	1.60%

Out of the 106 study subjects, 81 (76.4%) students were male and 25 (23.5%) were females. Fig 1 represents comparison of stress scores on the basis of gender. From this graph, it is evident that females had more academic

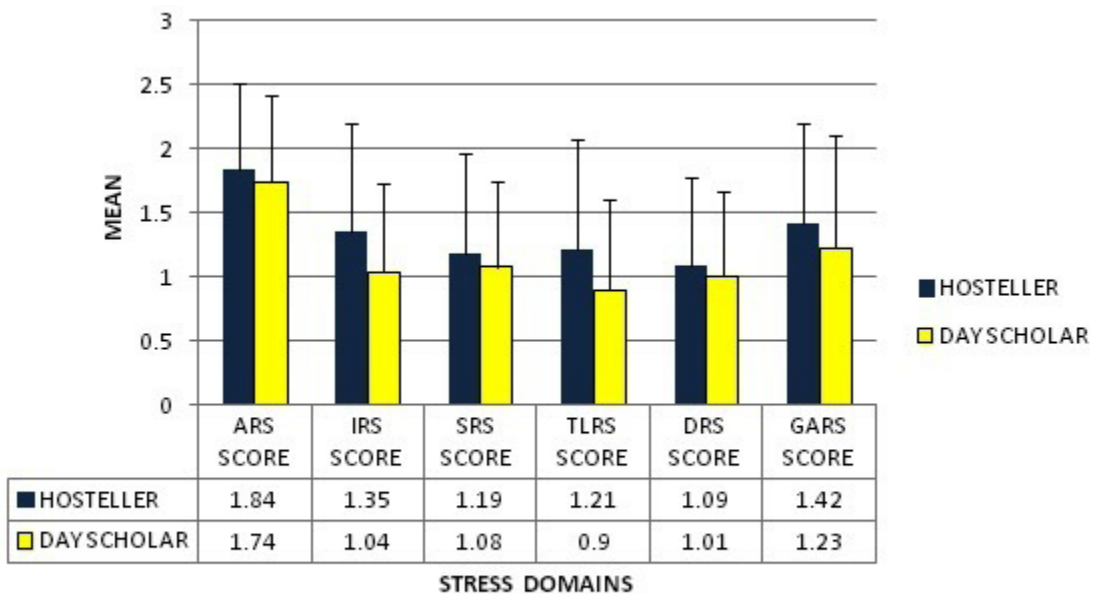
related stress (p value = 0.009) as compared to males. Also they had a higher level of Group Activity Related stress (p value = 0.011) than males.



**Figure 1: Comparison of stress scores on the basis of gender**

In our study, 63 (60%) students were hostellers and the rest 43 (40%) students were day scholars. Fig 2 depicts comparison of stress levels experienced by hostellers to that of day scholars. According to this

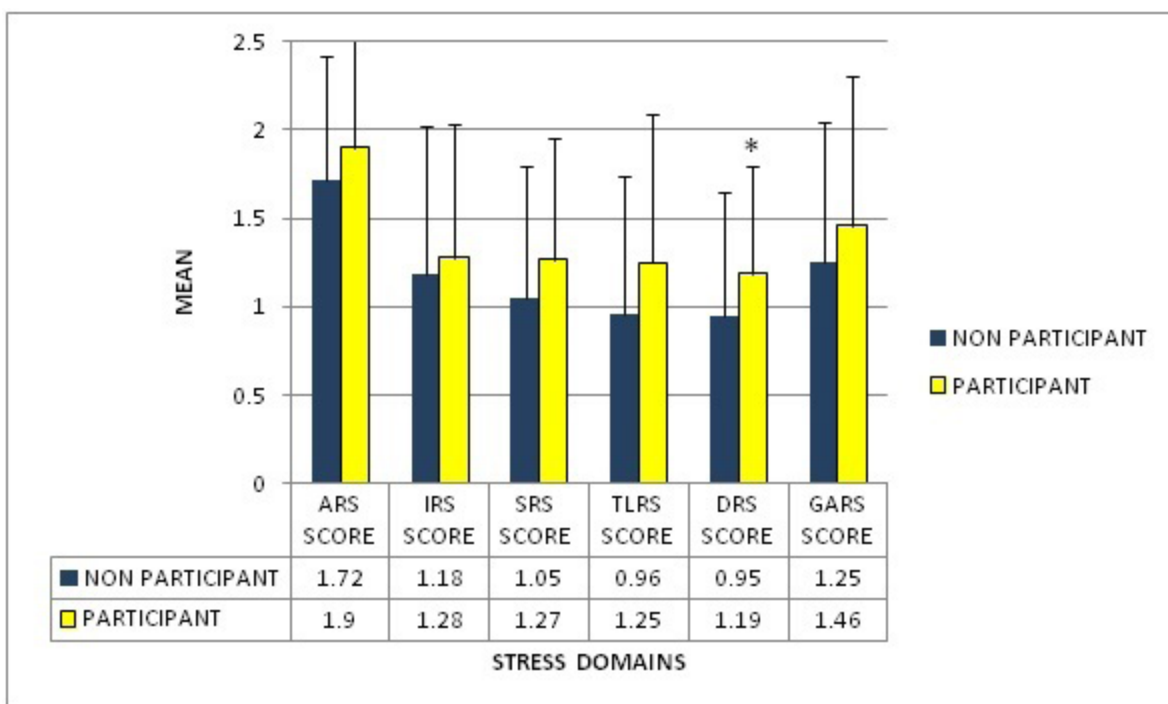
data, both the comparison groups were almost equally effected by all sorts of stressors and thus did not show any significant differences.



**Figure 2: Comparison of stress levels between hostellers and day scholars**

Fig 3 is a representation of stress level differences among students who actively participated (44%) in sports and cultural activities and the non participating (66%) section of students. This graph shows that,

students who participated in sports or cultural societies had higher Drive and Desire related stress (p value = 0.045) levels in contrast to the non-participants.



**Figure 3: Comparison of Stress levels between students who actively participated in sports and cultural activities and the non participating students**

Finally we correlated the stress scores of each domain with the student’s academic performance (total score of first professional marks available online after the declaration of University final exam result). And on analysis, it was found that the IRS score of students was negatively correlated with their first professional exam marks, i.e. when the Interpersonal and Intrapersonal issues related stress was high, the student’s academic performance tended to decrease. Also despite of higher stress levels among females, they still had a better academic performance (p value = 0.005) as compared to their male counterparts.

**Discussion**

The present study evaluated perceived stress among medical students including its sources and severity along with its correlation with academic performance.

In our study, students reported high academic related stress mainly due to examinations and excess syllabus. Some experienced severe stress due to unjustified grading process. Earlier studies from medical schools in different countries have reported varying levels of stress.<sup>[2-7,14,15]</sup> These studies have used different instruments to measure stress. Most of the other stress scales for medical students focuses only on academic

stressors, and lack inclusion of personal or psychosocial issues. This limits the comparability among these studies. We chose the MSSQ scale since this instrument has been documented for its reliability and validity.<sup>[13]</sup> All its components have shown a measure of high internal consistency. In addition to analysing academic related stressors, it includes questions pertaining to intrapersonal, interpersonal, social, drive, desire and group activities related stressors.

The amount and severity of stress experienced by medical students may vary according to the settings of the medical school, the curricula, evaluation (examination) system etc. The beginning of academic studies in a medical school may be a particularly stressful new stage of life. It was observed that students found medical training stressful during the first year, but the level of stress minimized in subsequent years. A new environment which is generally influenced by new people and work settings could be the predominant reason for this finding. Some students experience social and organizational challenges.<sup>[16,17]</sup> In terms of personal challenges, the failure to achieve previous school performance levels was reported as distressing by our study participants. Academic studies may be associated with chronic and high stress exposure, and prior evidence has shown



that such stress is linked to worse performance, poorer satisfaction, intentions to quit, and elevated depression, anxiety, higher risk of suicidal ideation or physical problems. Overall prevalence of stress in our study is less than that reported earlier.<sup>[6,14,15]</sup> A plausible reason of this could be the Counselling in form of mentorship system practiced in our college. Most of the other places lack academic counselling.

In the present study, females had more academic related and group activity related stress as compared to males. This is in agreement with earlier studies.<sup>[18]</sup> However, Cohen has reported that there was no significant difference in stress using PSS between male and female students.<sup>[19]</sup> The increased stress among female participants of our study was related to the improved academic performance in them. This contrasting finding in case of female students maybe explained on the basis the phenomenon of 'eustress' where an individual is motivated high enough because of stress to move to action to get things accomplished. Adlard have reported the similar results where the stress has been associated with improvement in performance.<sup>[20]</sup> This concept of Eustress, which enhances function was first published by Hans Selye.<sup>[12]</sup>

Coping strategies related to active and adaptive styles play a buffering role in mitigating stress experienced in medical studies (e.g., social networks). In our study, the students who participated in sports or cultural societies had higher drive and desire stress levels in contrast to the non-participants. This could possibly be due to lack of student's interest in the field of medicine and inability to freely pursue their hobbies due to academic burden. Devoting a part of their routine might lead to divided attention of students towards studies, as a result of which they are not able to fulfil what is actually expected from them, leading to a feeling of incompetence. Thus insufficient time for social demands is probably the cause of enhanced perceived stress in medical students. This finding is in line with earlier study where more than one third of medical students report not to have time to pursue individual interests.<sup>[16]</sup> Additional supportive evidence was reported by Kholoud<sup>[21]</sup> and Siraj et al.,<sup>[22]</sup> that high level of stress in the medical students can be attributed to the course workload, lack of leisure time, shortage of learning materials, and frequent examinations.

The IRS score of students in our study was negatively correlated with their first professional

exam marks, i.e. when the Interpersonal and Intrapersonal issues related stress was high, the student's academic performance tended to decrease. Chronic stress is reported to interference with a person's capacity to encode memory and to retrieve information.<sup>[23,24]</sup> During times of stress, the body reacts by secreting stress hormones into the bloodstream, which affects memory negatively. In particular, the hippocampus, prefrontal cortex, and the amygdala are affected by cortisol. Under normal circumstances, the hippocampus regulates the production of cortisol through a negative feedback mechanism, because it has many receptors that are sensitive to cortisol. However, excess cortisol in case of chronic stress impairs the ability of the hippocampus to both encode and recall memories. Deterioration of higher cognitive functions like concentration, retention, recall and mental fatigue are also reported with high level of stress. Different studies show different impact of stress on academic performance. It was observed that too much stress negatively interfered with student's preparation, concentration and performance while positive stress helped student achieve peak performance.<sup>[25]</sup>

The pre-Medical School academic performance could have an influence both on the predictor as well as the outcome. Academic performance at the time of admission varies among our students based on reservations. Students from varied socioeconomic strata get admitted in a government medical college in India. These factors could not be controlled in the present study.

In view of the increased propensity of medical students to be under stress, it was proposed that stress management in the form of incorporating and inculcating coping mechanisms should be included in medical curriculum.<sup>[25,26]</sup> The much needed reforms in the Medical Education in the form of Competency Based Undergraduate Medical Curriculum/Education (CBMC/E) were introduced by Medical Council of India (MCI) recently.<sup>[27]</sup> One-month, immediately after the admission, it is assigned to orient new students about the teaching program, help them adapt, learn language (English and local language), computer use, communication skills, time management, handling stress as well as adequate amount of time for sports and extra-curricular activities has been incorporated in the revised curriculum. These de-stressing techniques if properly implemented throughout the medical studies duration can improve the functioning and academic performance of the students.

**Limitations:** This a cross-sectional study conducted only in one medical college and lacks generalization of results. Since the information was obtained from a self-administered questionnaire, information bias cannot be ruled out. Due to the limited sample-size, the analyses were not powered to control for multiple potential confounders. As 44 out of 150 students did not willingly consent for the study, this could have affected the overall prevalence of stress in our students.

### Conclusions

Too much stress negatively interfered with student's preparation, concentration and performance while positive stress helped student achieve peak performance. Coping strategies related to active and adaptive styles can play a buffering role in mitigating stress and improve academic performance of the students.

**Ethical Clearance No.:** (UCMS) IEC-HR No 2019/39/4

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**Conflicts of Interest:** None

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# The Study of Influence of Psychosocial Rehabilitation on the Immunomodulatory Role of Alcohol Dependence, on Neutrophil Oxidative Burst Mechanism

Sanjay M. Goudar<sup>1</sup>, Sushma S.<sup>2</sup>

<sup>1</sup>Fourth year MBBS Student, Bangalore Medical College and Research Institute, Fort, K.R. Road, Bengaluru-560002, <sup>2</sup>Assistant Professor, Department of Physiology, Bangalore Medical College and Research Institute, Fort, K.R. Road, Bengaluru-560002

## Abstract

**Background:** Alcohol is known to affect the immune system in diverse ways. Various studies have brought to light changes in both innate and acquired immunity in alcohol dependant subjects, making them more vulnerable to infections as compared to the general population.

**Objective:** The current study emphasizes on the impact of alcohol on neutrophil oxidative burst mechanism and the changes in the same after a period of abstinence.

**Method:** of the 25 alcohol dependant subjects, 21 subjects who met the inclusion and exclusion criteria were included in the study. SADQ questionnaire was administered to group them into mild, moderate and severely dependant. Their blood samples were collected before and after a psychosocial rehabilitation programme and studied for neutrophil oxidative burst phenomenon using nitro blue tetrazolium dye reduction test.

**Result:** There was an increase in oxidative burst in all the subjects after the rehabilitation, however the increase was significant in mild and moderately alcohol dependant subjects.

**Conclusion:** The impaired oxidative burst in alcohol dependant subjects may pave a way for infections. Hence an early detection of dysregulated immunity in alcohol dependant subjects may help decrease the morbidity and mortality.

**Keywords:** Alcohol dependance, Neutrophil Oxidative Burst, SADQ questionnaire, Nitroblue Tetrazolium Dye Reduction Test.

## Introduction:

Neutrophils occupy a primal position in the non-specific immune response, more so in anti-bacterial defense mechanism as effectors, inducing and regulating cells.<sup>1</sup>

Neutrophils adhere to vascular endothelial cells, migrate to inflammatory foci, recognize and phagocytose opsonized bacteria.<sup>2</sup> These processes are augmented by chemotactic factors which enhance the metabolic activity of neutrophils, their aggregation,<sup>3</sup> and bactericidal abilities. The engulfed microorganisms are killed through both oxygen-dependent and independent mechanisms, simultaneously injuring the surrounding tissues.<sup>1</sup>

It is reported that there is a causal relationship between alcohol consumption and the occurrence of lung abscess, empyema, spontaneous bacterial peritonitis, diphtheria, cellulitis, meningitis, hepatic cell injury, certain cancers, pulmonary tuberculosis, etc.

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## Corresponding Author:

**Dr. Sushma S., MBBS, MD**

Assistant Professor, Department of Physiology,  
Bangalore Medical College and Research Institute,  
Fort, K.R. Road, Bengaluru-560002

e-mail: [suvina76@gmail.com](mailto:suvina76@gmail.com)

Phone: 9916915194

worldwide,<sup>4,5</sup> stemming from an exaggeration of the oxidative stress mechanism<sup>6</sup> and/or the remodeling of the body's normal immune systems at various levels.<sup>7</sup>

Several studies have asserted that alcohol suppresses several leukocyte functions like adhesion, chemotaxis, phagocytosis, superoxide anion production and oxygen metabolism.<sup>8</sup>

We hypothesized that neutrophil stimulation is associated with impaired immune responses to ongoing bacterial challenge, rendering alcohol dependent subjects more susceptible to infection. Furthermore, although neutrophil dysfunction is reported to contribute to immune paresis in alcohol intake, to date there is insufficient data available in connection with the changes of impaired neutrophil oxidative burst in psychosocially rehabilitated alcohol dependent subjects.

Hence, in the present experimental study, an attempt is made to assess the influence of psychosocial intervention on the neutrophil functions as estimated by superoxide ion release (oxidative burst) and to evaluate the possible correlation, in Indian alcohol dependent males, using the Nitro Blue Tetrazolium (NBT) reduction test.<sup>9,10</sup>

Our data gives an insight into the conflicting results of clinical trials and may suggest a rationale to select an appropriate, evidence- based, non-pharmacological and psychosocial therapy tailored to the patient.

**Aims and Objectives:** To study the neutrophilic generation of Reactive Oxygen Intermediates (Oxidative Burst) in alcohol dependent subjects, before and after psychosocial rehabilitation.

## Materials and Method

**Study design:** Before and After Comparison study.

**Type of Study:** Non-randomized Interventional study

**Study Site:** The study was conducted in the Department of Physiology, after recruiting the subjects from a Psychosocial Rehabilitation center for Alcohol Dependents, in Bengaluru.

**Duration of study:** May 2018 – June 2018.

**Number of subjects:** 21 alcohol dependent males

**Ethical Clearance and informed consent:** Taken

### Inclusion Criteria:

1. Men in the age group between 25 and 50 years.
2. Men with a history of alcohol dependence.

### Exclusion Criteria:

1. History of diabetes and hypertension.
2. History of cardiac pathology.
3. History of neurological, psychiatric and endocrine disorder.
4. Subjects with hepatic cirrhosis.
5. Cases of any autoimmune disorder.
6. History of any acute or chronic infections.
7. Smokers.
8. History of any carcinoma
9. Hematological disorders.

**Choice of subjects and control:** 25 alcohol dependent males attending psychosocial rehabilitation programme were enrolled for the study. Excluding four subjects as per the exclusion criteria, the study group included 21 subjects.

**Study Protocol:** The experimental procedures were reviewed and approved by the Institutional Ethics Committee. The baseline data of the subjects was recorded by a questionnaire and clinical examination. The Severity of Alcohol Dependence Questionnaire (SADQ) was administered to measure the level of alcohol dependence and they were grouped into mild (score of below 16), moderate (score of 16-30) and severe alcohol dependence (score of 31 or higher).

Under strict aseptic precautions, 3 ml of venous blood samples was collected in a heparinized vial, twice from each subject, one at the time of recruitment into the center and the other after 40 days of rehabilitation programme.

**NBT (Nitro Blue Tetrazolium) Test for the Detection of Generation of Reactive Oxygen Intermediates:** This test utilized stimulated and unstimulated neutrophils for evaluation. *Escherichia coli* (*E. coli*) endotoxin (Hi Media Labs) was used to stimulate the cells. The unstimulated cells act as the control. Two test tubes labelled 'Control'(C) and 'Test'(T) were taken. To both the test tubes, 50µL of NBT dye 0.34% and 100 µL of heparinized blood of the

subject were added. Then, Hank's balanced salt solution 250  $\mu\text{L}$  in (C) and 200  $\mu\text{L}$  in (T) was pipetted. Finally, 50  $\mu\text{L}$  of the *E. coli* endotoxin was added to (T).

The assembly incubated at 37°C for 20 min was then allowed to cool for 20 min, at room temperature. Smears prepared from both test and control samples were air dried, fixed with methanol, and then stained with Giemsa. After 10-15 min, the slides were washed under running water and allowed to dry. 100 neutrophils were counted under 100x and the % of neutrophils exhibiting the dark blue formazan granules was estimated, for both (C) and (T), and the results were compared <sup>9</sup>.

The above experiment was carried out with every subject's blood sample, before and after the rehabilitation.

The characteristics of the study subjects were tabulated for description using frequencies. The NBT reduction, measuring the oxidative burst of neutrophils, before and after the psychosocial rehabilitation were compared.

**Statistical Method:** The data was compiled in Microsoft Excel sheet. Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean  $\pm$  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, dependent) has been used to find the significance of study parameters on continuous scale within each group.

Paired Proportion test has been used to find the significance of proportion in paired data. The statistically significant figures considered were:

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

\* Moderately significant (P value: 0.01 < P  $\leq$  0.05)

\*\* Strongly significant (P value: P  $\leq$  0.01)

## Results

Among the 21 alcohol dependent males in the age group of 25- 50 yrs, 7 had mild alcohol dependence (SADQ score  $\leq$  16), 10 had moderate (score 16-30) and 4 had severe alcohol dependence (>31), with Mean  $\pm$  SD of 25.61  $\pm$  9.8. (Table-1).

**Table 1: Alcohol dependents as per SADQ score**

SADQ score	No. of alcohol dependents	%
$\leq 16$	7	33.33%
16-30	10	47.61%
>31	4	19.04%
<b>Total</b>	<b>21</b>	<b>100.0</b>

Mean  $\pm$  SD: 25.61  $\pm$  9.

**Assessment of Neutrophil Oxidative Burst:** The Neutrophil Oxidative Burst was assessed by NBT reduction assay. The stimulated neutrophils sequester the NBT dye into the phagosomes and the intracellular reduction of dye converts it to insoluble blue crystals of formazan.

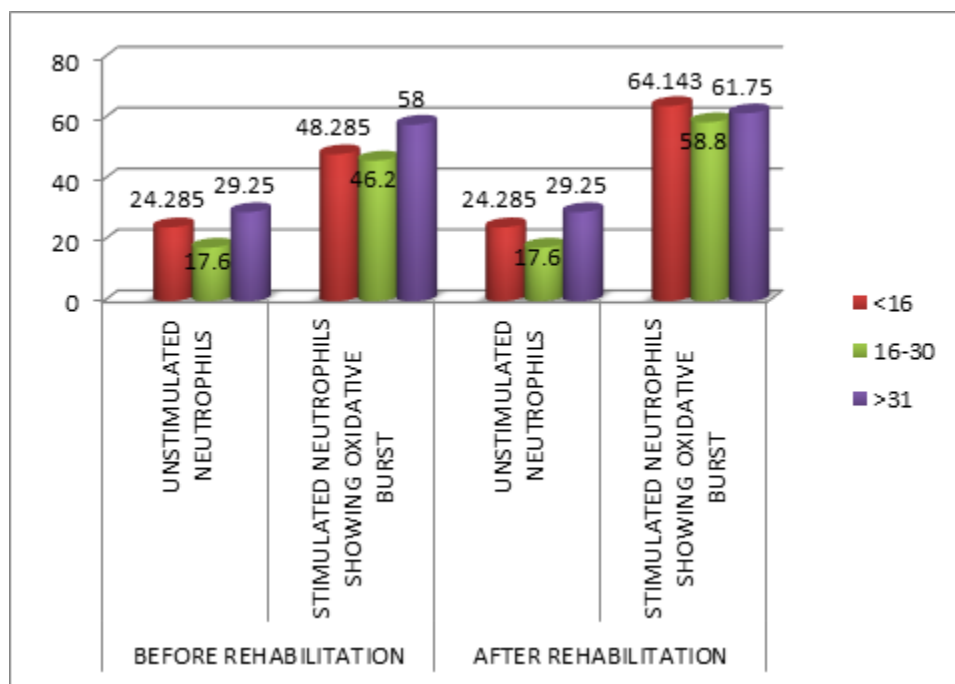
**Table 2: % of Neutrophils showing oxidative burst according to SADQ score before and after rehabilitation**

SADQ	% of neutrophils showing oxidative burst before rehabilitation		p-value b/w stimulated and unstimulated	% of neutrophils showing oxidative burst after rehabilitation		p-value b/w stimulated before and after rehabilitation
	Unstimulated*	Stimulated		Stimulated	p-value b/w stimulated and unstimulated	
$\leq 16$	24.28 $\pm$	48.28 $\pm$	0.005	64.14 $\pm$ 10.45	<0.001	0.018
Mild	14.84	11.31				
16-30	17.6 $\pm$ 6.82	46.2 $\pm$	<0.001	58.8 $\pm$ 9.57	<0.001	0.1015
Moderate		12.25				
E						
>31	29.25 $\pm$	58 $\pm$ 4	0.01582	61.75 $\pm$ 12.76	0.02163	0.5952
Severe	16.8					

\*% of neutrophils showing oxidative burst in unstimulated state is taken as baseline control

After rehabilitation, the % of NBT positive stimulated cells was  $64.14 \pm 10.45$  vs  $48.28 \pm 11.31$  in mild dependence,  $58.8 \pm 9.57$  vs  $46.2 \pm 12.25$  in moderate, and  $61.75 \pm 12.76$  vs  $58 \pm 4$  in severe alcohol dependents, when compared to pre-rehabilitation. (Table-2, Fig-1) Ethanol resulted in an increase of neutrophil burst activity among all the dependents, after

rehabilitation. However, among the mild and moderate alcohol dependents, there was a statistically significant increase in oxidative burst activity after rehabilitation. There was no statistical difference in oxidative burst response to stimulation in severely alcohol dependents in pre and post rehabilitation.



**Figure 1: Percentage of neutrophils in different SADQ categories showing oxidative burst, in unstimulated and stimulated states, before and after rehabilitation**

## Discussion

The results of the present study indicate that there was a significant increase in the % of neutrophils showing Oxidative Burst, in alcoholic dependents post psychosocial rehabilitation, as compared to pre-rehabilitation.

However, the results were significantly more evident in mild and moderate alcohol dependents.

This signifies that neutrophils in alcoholics who are abstained from alcohol intake, tend to show an increased metabolic activity. The alcohol dependents in whom the % of neutrophils showing oxidative burst is high, (indicated by a resting burst greater than or equal to 20-30%) are likely to have a high risk of infection and strategies to remove endotoxin may be more beneficial.

Our findings corroborate with studies by Sato et al.<sup>11</sup> in male subjects, who showed a trend of increased ROS production.

Defective neutrophil Oxidative Burst can pave a way for the development of infection. Altogether, these observations suggest the cryptic role of ethanol-induced oxidative stress in stimulating the immune reactions against both allo- and self-antigens, causing tissue injury.

## Conclusion

In conclusion our study demonstrated that the Neutrophil oxidative burst could be impaired in alcohol dependents with altered immune functions, Neutrophils in alcohol dependents seem to be much more effective in producing ROS, after a short term psychosocial

rehabilitation . The result of this study has demonstrated the importance of monitoring the neutrophil functions during rehabilitation.

**Acknowledgement:** I am grateful to all the subjects of the study for their kind cooperation. I am indebted to Bangalore Medical College and Research Institute for providing the much required motivation to the budding doctors in the area of research.

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** Taken

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# Evaluation of Risk of Type 2 Diabetes Mellitus in Medical Students Using Indian Diabetes Risk Score (IDRS)

Tejashwini V.B.

Associate Professor, Department of Physiology, Basaveshwara Medical College & Research hospital, Chitradurga

## Abstract

**Background:** Diabetes as a non-communicable disease is significant public health problem all over the world. Type 2 Diabetes Mellitus (T2DM) is a disease that develops slowly and over time and only recently has it become evident that T2DM finds its presence even among the younger age groups. Therefore a cross sectional study has been conducted to evaluate and assess the risk for developing T2DM among undergraduate students using Indian Diabetes Risk Score (IDRS), a questionnaire that is simple, validated and has proven to be highly effective in previous studies.

**Objectives:** To evaluate the risk of developing diabetes among medical students using Indian Diabetes Risk score.

**Method:** The study included 100 MBBS students. Detailed history was taken which includes information regarding their age, family history of diabetes and exercise. Waist circumference was measured. Risk of diabetes was calculated using Indian Diabetes Risk Score.

**Results:** Risk of developing diabetes was high in 6%, moderate in 87.3% and low in 9.7% of students.

**Conclusion:** Risk of diabetes was present in more than 50% of medical students as assessed by Indian Diabetes Risk Score.

**Keywords:** Type 2 Diabetes mellitus, IDRS, Obesity, Physical activity, Family history.

## Introduction

India leads the world with the highest number of diabetic patients earning the distinction of being termed the “diabetes capital of the world”.<sup>[1]</sup> It is estimated that the number of diabetic subjects will rise to 69.9 million from 42 million by the year 2025. We can expect diabetes to have a serious damaging impact on the longevity as well as the quality of life in India. The increasing modernization, sedentary lifestyle and unhealthy

dietary habits in rural and urban India has taken its toll on the health of the general public, especially the youth.<sup>[2]</sup> Diabetes mellitus (DM) can be split primarily into two types: Type I or Insulin dependent diabetes mellitus (IDDM) and Type 2 or Non-insulin dependent diabetes mellitus (NIDDM). Type 2 DM (T2DM) is a non-incapable of producing enough insulin, characterized by abnormal glucose homeostasis. Its pathogenesis appears to involve complex interactions between genetic predisposition and environmental factors.<sup>[3]</sup> T2DM occurs when impaired insulin resistance is accompanied by the failure to produce ample amount of  $\beta$ -cell insulin.<sup>[4]</sup>

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### Corresponding Author:

Tejashwini V.B.

Associate Professor, Department of Physiology,  
Basaveshwara Medical College, Chitradurga-577501,  
Karnataka

e-mail: teju23091987@gmail.com

Evidences suggest that premature detection of diabetes by suitable screening method, especially in subjects with elevated risk for diabetes will help to intercept or delay the vascular complications and thus reduce the clinical, social and economic burden of the

disease. Indian Diabetes Risk Score (IDRS) is a simple and effective screening tool to evaluate risk of diabetes in future. It involves four parameters namely age, parental family history of diabetes, WC and physical activity to calculate the score as shown in table 1. A score of > 60 denotes high risk, 30 - 50 moderate and < 30 low risk.

[1] In the present study the risk of diabetes in medical students was evaluated using IDRS.

**Table 1: Indian Diabetes Risk Score**

Particulars	Score
<b>Age (Years)</b>	
< 35 (reference)	0
35-49	20
>50	30
<b>Abdominal obesity:</b>	
Waist <80 cm (female), <90 (male) (reference)	0
Waist > 80-89 cm (female), >90-99 cm (male)	10
Waist >90 cm (female), >100 cm (male)	20
<b>Physical activity:</b>	
Exercise [regular] + strenuous work [reference]	0
Exercise [regular] or strenuous work	20
No exercise and sedentary work	30
<b>Family history</b>	
No family history [reference]	0
Either parent	10
Both parents	20
Minimum score	0
Maximum score	100

**Objectives:** To evaluate the risk of developing diabetes among medical students using Indian Diabetes Risk Score.

### Method

The study included 100 MBBS students. Ethical Clearance was obtained from Institutional Ethical Committee and informed consent was taken. Any known case of type 2 DM, PCOD, thyroid disorder were excluded from the study. Detailed history was taken about age, family history of diabetes and exercise. Students performing moderate to vigorous physical activity for at least 20 minutes a day regularly or 150 minutes per week were grouped under positive exercising group.[5] Measurement of the WC was taken directly on the body with light clothing midway between the lowest

rib and the iliac crest and hip circumference at the level of the greater trochanters with legs close together, after a normal expiration using a non-stretchable measuring tape by average of three measurements nearest to 0.5 cm.[6] The individuals were classified as having high risk (score >60), moderate risk (score 30-50) and low risk (score <30) out of a total score of 100.[7],[1]

**Statistics:** Descriptive analysis was carried out to evaluate the risk of developing diabetes in them and presented categorically in percentage

### Results

Mean age of the study group was 19.3 + 1.4 years. Out of 100 students, 50 were females and 50 males. The distribution of WC is shown in table 2. 30.6% of the students had parental history of diabetes. 28.6% of them had history of one parent being diabetic and 2% had both parents diabetic. Only 15% of them were exercising regularly and rest 85% were non exercising. Risk of diabetes was calculated using Indian Diabetes Risk Score (IDRS) as shown in table 3.

**Table 2: Distribution of WC among medical students:**

		Females		Males	
WC	Cut off	<80 cm	>80cm	<90cm	>90cm
	% of student	60	40	65	35

**Table 3: Risk of developing diabetes mellitus in medical students**

IDRS	High (>60)	Moderate (30-50)	Low (<30)
	6%	87%	7%

### Discussion

In this cross sectional study, 100 MBBS students were enrolled. Indian diabetes risk score was used to predict risk of developing diabetes in them. As all the students were less than 35 years of age, all obtained a score of zero for age. Therefore the score was calculated using waist circumference, parental family history and exercise. Based on Asian standards[7], central obesity as predicted by WC was prevalent in 40% of females and 35% of males. Central obesity specially is shown to be an important risk factor for cardio metabolic diseases. Unlike subcutaneous fat, visceral fat is drained by the portal venous system and has a direct connection with the liver, resulting in an influx of free fatty acid availability

in the liver. In visceral fat, mobilization of free fatty acids is faster because of higher lipolytic activity in visceral adipocytes, resulting in higher free fatty acids in the systemic circulation where it forms plaque on the artery walls, resulting in high blood pressure and cardiovascular disease. Additionally, an influx of free fatty acid availability in the liver decreases hepatic insulin extraction, resulting in systemic hyperinsulinemia, and inhibits the suppression of glucose production by insulin. [8] Parental history of diabetes was present in around 30% of the students. And 85% of the students were not exercising regularly neither were they performing any strenuous work. The sedentary lifestyle is independent risk factor of diabetes. After computing for IDRS scores it was found that 6% of the subjects were already in the high risk group. Around 87% were in moderate risk group. If steps are not taken to control their obesity, they may land up in high risk group after age of 35 years. Our results are consistent with a similar study done in Pune which showed 4% in high risk group and 76% in moderate risk. [9] Another study done in Mangalore revealed 1/3rd of students at high to moderate risk. [10]

### Conclusion

Abdominal obesity was present in more than 50% of the medicos. Around one third of the students had positive family history of diabetes. Also a high percentage (85%) of them was sedentary. The current data shows an increased risk of diabetes in most of them. Family history is a non modifiable factor. Therefore immediate steps should be taken to reduce the obesity by encouraging these students to increase physical activity and diet control.

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**Ethical Clearance:** Taken from college Ethical committee.

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# Study of Effect of Various Grades of Exercise on Serum Proteins in Healthy Young Indian Adults

Tripti Tripathi<sup>1</sup>, Sonali Saxena<sup>2</sup>, Saurabh Saha<sup>3</sup>, Jalaj Saxena<sup>4</sup>,  
Dolly Rastogi<sup>5</sup>, Chitra Srivastava<sup>6</sup>, Preeti Kanowjia<sup>7</sup>

<sup>1</sup>Assistant Professor (Physiology), <sup>2</sup>Associate Professor (Medicine), <sup>3</sup>Associate Professor (Physiology),  
<sup>4</sup>Professor & Head (Physiology), <sup>5</sup>Professor (Physiology), <sup>6</sup>Associate Professor (Physiology), <sup>7</sup>Assistant Professor  
(Physiology), Department of Physiology, G.S.V.M. Medical College, Kanpur

## Abstract

Serum total protein levels changes occur as a result of various grades of exercise intensity. The main objective of this study was to evaluate the effect of different grades of exercise on the serum levels of proteins in healthy young Indian adults. Fifty six healthy students (28 each, male and female) with an age range of 18–27 years were subjects in this study. The participants performed an exercise test of moderate to vigorous intensity on bicycle ergometer. The serum concentrations of total serum proteins were measured by colorimetric method. The results show significantly different and lower (9.9%) total serum protein level after moderate exercise ( $7.10 \pm 0.18$  vs.  $6.40 \pm 0.14$ , mean difference=0.70,  $q=4.78$ ,  $p<0.01$ ) and higher (7.9%) after severe exercise ( $7.10 \pm 0.18$  vs.  $7.72 \pm 0.12$ , mean difference=0.61,  $q=4.18$ ,  $p<0.05$ ) as compared to baseline was observed. Further, the mean total serum protein level also increases (17.0%) significantly after severe exercise as compared to after moderate exercise ( $6.40 \pm 0.14$  vs.  $7.72 \pm 0.12$ , mean difference=1.31,  $q=8.96$ ,  $p<0.001$ ). These results support the different grades of exercise affect serum total proteins.

**Keywords:** Exercise, Serum Protein, Ergometer, Endurance.

## Introduction

Impact of physical activity and exercise on human population, focusing mainly on health benefits, have gained much attention since long back. It is well established that physical exercise can provoke large and diverse changes in the concentration of many biochemical parameters from resting levels Kim DY et al (2014)<sup>[1]</sup>.

Physical exercise generally delays aging, strengthens muscles improves cardiovascular health, helps in weight

loss and boost the immune system. Physical exercise is also known to prevent many “diseases of affluence” such as coronary artery disease, type 2 diabetes mellitus and obesity Kim DY et al (2014)<sup>[1]</sup>. Proteins are used as auxiliary fuels during muscular work and few stored amino acids are linked with fats and form lipoproteins. The tissue proteins are broken down to amino acids in order to get energy but the amino acids liberated in the process are not used as fuels instead they are stored in blood as protein during exercise. Serum proteins, present in blood plasma serve many other functions, including transport of lipids, hormones, vitamins and minerals in the circulatory system and the regulation of a cellular activity and functioning of the immune system. Many blood proteins act as enzymes, complement components, protease inhibitors or kinin precursors. The total protein consists of two major groups of proteins: albumin and globulin. Serum albumin accounts for 55% of blood proteins, and is a major contributor to maintaining the osmotic pressure of plasma to assist in

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### Corresponding Author:

**Dr. Saurabh Saha**

Associate Professor, Department of Physiology,  
G.S.V.M. Medical College, Kanpur  
e-mail: drsahagsvm@gmail.com

the transport of lipids and steroid hormones. Globulins make up 38% of blood proteins and transport ions, hormones, and lipids assisting in immune function. Fibrinogen comprises 7% of blood proteins; conversion of fibrinogen to insoluble fibrin is essential for blood clotting. The remainder of the plasma proteins (1%) is regulatory proteins, such as enzymes, pro-enzymes, and hormones. All blood proteins are synthesized in liver except for the gamma globulins. The specific blood proteins include: Prealbumin (transthyretin), Alpha 1 antitrypsin (neutralizes trypsin that has leaked from the digestive system), Alpha 1 acid glycoprotein, Alpha 1 fetoprotein, alpha2-macroglobulin, Gamma globulins, Beta-2 microglobulin, Haptoglobin, Ceruloplasmin, Complement component 3, Complement, component 4, C-reactive protein (CRP), Lipoproteins (chylomicrons, VLDL, LDL, HDL), Transferrin, Prothrombin and MBL or MBP. It is also reported that acute exercise may induce high levels of salivary cortisol, TNF-alpha and nitric oxide. Muscle protein synthesis is regulated by two main anabolic stimuli, food intake and physical activity. The dietary protein derived amino acids act as key signaling proteins activating anabolic pathways in skeletal muscle tissue and provide building blocks for muscle protein synthesis. Ingestion of meal protein elevates muscle protein synthesis rates for 2-5 h following meal ingestion. Differential stimulation of myofibrillar and sarcoplasmic protein synthesis on protein ingestion at rest and after resistance exercise has been reported by Moore DR et al (2009)<sup>[2]</sup>. The physical exercise directly stimulates skeletal muscle protein synthesis, and has been shown to persist for up to 24 h after cessation of exercise in young men as seen by Burd NA et al (1997)<sup>[3]</sup>. Different types of exercise will stimulate the synthesis of different sets of proteins. Whereas Kyilasov AF et al (2011)<sup>[4]</sup> found that resistance type exercise strongly stimulates the synthesis of muscle contractile (myofibrillar) proteins, endurance type exercise will have a greater impact on stimulating the synthesis of mitochondrial proteins, thereby allowing exercise-specific muscle adaptation. Regular and moderate exercise has favourable effects on the immune system by increasing immunoglobulins which are potent protective factors as observed by Karacabey K et al (2005)<sup>[5]</sup>. In prolonged exercising subjects albumin level is significantly raised and the raised albumin in serum is important as it may scavenge reactive oxygen species generated during exercises was found by both Brzeszczynska J et al (2008)<sup>[6]</sup> and Malatesta D et al (2009)<sup>[7]</sup>. In vigorously exercising subjects compared with the controls increased levels of aspartate

transaminase (AST), total protein (TP), albumin, urea and high density lipoprotein-cholesterol (HDL-C) were observed while the levels of Na<sup>+</sup>, K<sup>+</sup>, cholesterol (TC), triglycerides (TG), low density lipoprotein-cholesterol (LDL-C) and glucose were significantly reduced as found by Johnson JL et al (2007)<sup>[8]</sup>. The level of proteins that differ between groups indicate a long-term exercise effect on plasma protein concentrations was an important finding of Schild M et al (2016)<sup>[9]</sup>. Sedgwick M et al (2016)<sup>[10]</sup> observed that acute bout of high-intensity interval rowing increased plasma thrombin generation immediately after exercise, but these differences were eliminated 16-24 h after exercise.

## Materials and Method

The present study was carried out on 56 Subjects, 28 males and 28 female students of 18 to 27 years age of 1<sup>st</sup> year M.B.B.S. in the Department of Physiology, G.S.V.M. Medical College, Kanpur. The subjects were told about the study and their written consent was taken. A working proforma was asked to be filled by every subject which consisted of Name, Age, Sex, Occupation, Address, history of physical exercise, Addiction, Drug History, Personal or family history of Diabetes, Hypertension and Heart Disease and also history of any chronic disease. Subjects with the history of any chronic disease, endocrinopathy or subjects taking steroidal hormonal drug (exogenous testosterone or steroid), alcoholics, smokers, sportsperson and athletes were excluded from the study. All physical parameters like age (years), Height (cms), Weight (Kgs) and blood pressure (mm Hg) were recorded initially in all subjects. The subjects were divided into two groups after defining their body mass index (BMI) and classified as non-obese group with BMI < 25 kg/m<sup>2</sup> and obese group with BMI ≥ 25 kg/m<sup>2</sup>.

After measurements the subjects were instructed to warm-up on the cycle ergometer for 5 minutes at a very light workload. At this time, the seat height was adjusted to the optimal height and comfort. The light warm up was followed up by 5 minutes of stretching, primarily emphasizing the torso and the lower extremities. Subject was subsequently properly fit with a mouthpiece and oxygen uptake which was used to make sure that the values were normal and the metabolic system was functioning properly. The incremental exercise test began at a workload previously determined by the subject's training history and any previous VO<sub>2</sub> max data results reported by the subject. The workload increased at

the end of the 3 minute intervals (stages) until volitional fatigue. The target of the exercise was to achieve a heart rate 125-130 beats/minute (severe exercise) and it was achieved in 10 to 15 minutes by doing the cycling without any extra load. The brink of exhaustion after 10 minutes of exercise was taken as end point of the exercise for that subject. The baseline readings of total serum total protein were taken before exercise. The subjects were then asked to do various grades of exercise on the alternate day basis under supervision. Total serum proteins were then measured after exercise period ended. The 20% differences in the intensities of each of the exercise trials were chosen to prevent any potential overlap in workloads within each subject's exercise trials. The workload was set beforehand, but was occasionally adjusted after the protocol was initiated based on the subjects' metabolic responses. The reported workloads were mean values calculated over the duration of the 30 minutes of exercise. Collection and storage of blood sample was done as the first blood samples (3 mL) as baseline, after placement of a catheter, were collected using a 3-cc syringe and a 25 gauge needle in the morning between 9 a.m.- 2.00 p.m. at the Department of Physiology, G.S.V.M Medical College, Kanpur. All samples were immediately transferred into a sterile vial (Vacutainer) and allowed to clot. The blood samples were then spun at 3000 rpm and 4°C using a refrigerated centrifuge to separate the serum. The plasma was pipetted into cryo-freeze tubes and stored at -80°C degrees Celsius in an ultra freezer. After the blood sample was taken, subjects were allowed to actively cool down on the cycle ergometer, followed by a resting period. After 30 minutes recovery post-exercise, moderate and severe exercise were done by subjects with Heart rate (HR) reaching  $> 25 \pm 50\%$  and  $> 50\%$  respectively of the baseline HR. Then last blood samples were collected. These four trials were randomized and separated by a minimum of 72 hours. Estimation of total serum proteins was done by the stored serum.

Statistical analysis of groups was compared by independent Student's t test. Continuous groups were also compared by repeated measures one way analysis of variance (ANOVA) and the significance of mean difference between the groups was done by Tukey's HSD (honestly significant difference) post hoc test after ascertaining normality by Shapiro-Wilk's test and homogeneity of variance by Levene's test. Pearson correlation analysis and simple linear regression analysis were done to assess association and strength of

association between the variables respectively.

A two-tailed ( $\alpha=2$ ) p value less than 0.05 ( $p<0.05$ ) was considered statistically significant. Analyses were performed on SPSS software (windows version 17.0).

## Observations and Results

The age of subjects ranged from 18-27 yrs with mean ( $\pm$  SE)  $19.59 \pm 0.19$  yrs and median 19 yrs. The most of the subjects were  $\leq 20$  yrs (83.9%). Further, among subjects, 28 (50.0%) were females and 28 (50.0%) were males. The height, weight and BMI of subjects ranged from 141-183 cm, 39-94 kg and  $18-30 \text{ kg/m}^2$  respectively with mean ( $\pm$  SE)  $163.29 \pm 1.49$  cm,  $60.10 \pm 1.47$  kg and  $22.45 \pm 0.38 \text{ kg/m}^2$  respectively and median 162 cm, 60 kg and  $22 \text{ kg/m}^2$  respectively. The height, weight and BMI of most the subjects were  $\leq 165$  cm (57.1%),  $\leq 60$  kg (53.6%) and  $\leq 25 \text{ kg/m}^2$  (85.7%) respectively. The SBP and DBP of subjects ranged from 94-154 mmHg and 64-104 mmHg respectively with mean ( $\pm$  SE)  $114.93 \pm 1.74$  mmHg and  $77.38 \pm 1.23$  mmHg respectively and median 112 mmHg and 80 mmHg respectively. The SBP and DBP of most the subjects were  $\leq 120$  mmHg (78.6%) and  $\leq 80$  mmHg (78.6%) respectively i.e. mostly within normal range.

The mean total serum protein decreased after moderate exercise while increased after severe exercise as compared to baseline. Comparing the mean total serum protein level of three group/periods, ANOVA showed significantly different total serum protein level among the groups ( $F=20.12$ ,  $p<0.001$ ).

**Table 1: Association between basic characteristics and outcome measures after moderate exercise (n=56)**

Basic characteristics	N	Mean $\pm$ SE	p-value
Age (yrs):			
$\leq 20$	47	6.49 $\pm$ 0.16	0.161
$> 20$	9	5.96 $\pm$ 0.26	
Sex :			
Female	28	6.79 $\pm$ 0.17	0.004
Male	28	6.01 $\pm$ 0.19	
Height (cm):			
$\leq 165$	32	6.71 $\pm$ 0.18	0.009
$> 165$	24	5.99 $\pm$ 0.19	
Weight (kg):			
$\leq 60$	30	6.69 $\pm$ 0.18	0.028
$> 60$	26	6.08 $\pm$ 0.20	

Basic characteristics	N	Mean±SE	p-value
BMI (kg/m <sup>2</sup> ):			
<25	48	6.34±0.15	0.264
≥25	8	6.79±0.39	
SBP (mmHg):			
≤120	44	6.53±0.16	0.072
>120	12	5.93±0.24	
DBP (mmHg):			
≤80	44	6.52±0.15	0.102
>80	12	5.97±0.31	

Further, the mean total serum protein levels over the periods were also compared according to gender. The mean total serum protein in females decreased after moderate exercise while it reached almost similar level as of baseline after severe exercise. In contrast, in males, it also decreased after moderate exercise but increased after severe exercise.

Comparing the mean total serum protein levels between the periods, Student 't' test and Tukey test showed similar ( $p>0.05$ ) total serum protein level between the periods in females. In contrast, in males, it decreased significantly ( $p<0.001$ ) after severe exercise as compared to baseline. Further, in males, it increased significantly ( $p<0.001$ ) after severe exercise as compared to moderate exercise. Comparing the mean total serum protein level between the genders, Student 't' test and Tukey test showed similar ( $p>0.05$ ) total serum protein level between the genders at all periods.

**Table 2: Association between basic characteristics and outcome measures after severe exercise (n=56)**

Basic characteristics	N	Mean±SE	p value
Age (yrs) :			
≤20	47	7.69±0.14	0.671
>20	9	7.83±0.23	
Sex :			
Female	28	7.48±0.13	0.042
Male	28	7.96±0.19	
Height (cm) :			
≤165	32	7.60±0.15	0.264
>165	24	7.87±0.19	
Weight (kg) :			
≤60	30	7.52±0.12	0.082
>60	26	7.94±0.21	
BMI (kg/m <sup>2</sup> ) :			
≤25	48	7.68±0.13	0.403
>25	8	7.96±0.27	

Basic characteristics	N	Mean±SE	p value
SBP (mmHg) :			
≤120	44	7.64±0.13	0.216
>120	12	8.00±0.29	
DBP (mmHg) :			
≤80	44	7.54±0.11	0.004
>80	12	8.36±0.34	

To assess the influence of basic characteristics (age, sex, height, weight, BMI, SBP and DBP) on outcome measures (heart rate, serum cortisol level and total serum protein level), the Pearson correlation analysis was done. The heart rate did not correlate significantly ( $p>0.05$ ) with any of the basic characteristics indicating that heart rate did not associate to basic characteristics either at pre exercise or post exercise (moderate and severe).

At moderate exercise, total serum protein level showed significant ( $p<0.05$  or  $p<0.01$ ) and negative (inverse) correlation with both sex and height but significant and positive correlation with sex, weight and DBP at severe exercise indicating that total serum protein level inversely associated to sex and height during moderate exercise while directly associated to sex, BMI and DBP during severe exercise. The mean total serum protein was found significantly ( $p<0.05$ ) different and higher in females as compared to males. For Moderate exercise, the association between basic characteristics and outcome measures (HR, serum total serum protein concentrations) after moderate exercise. The all outcome measures were found significantly associated to sex. Further, total serum protein was found significantly associated to height. Moreover, total serum protein was also found to be associated with weight.

**Table 5: For each gender, comparison (p value) of mean total serum protein level between the periods by Student 't' test and Tukey test**

Groups/Periods	Mean±SE (n=56)	p-value
Baseline	7.10 ± 0.18	<0.001
After moderate exercise	6.40 ± 0.14	
After severe exercise	7.72 ± 0.12	

**Table 3: Pre and post exercise total serum protein concentration (g/dL) of subjects**

Comparison	Female	Male
Baseline vs. After moderate exercise	0.110	0.074
Baseline after severe exercise	1.000	<0.001
After moderate exercise vs. After severe exercise	0.106	<0.001

For Severe exercise, the total serum protein was found significantly associated to sex and DBP.

**Table 4: For each gender, comparison (p value) of mean total serum protein level between the periods by Student ‘t’ test and Tukey test.**

Comparison	Female	Male
Baseline vs. After moderate exercise	0.110	0.074
Baseline after severe exercise	1.000	<0.001
After moderate exercise vs. After severe exercise	0.106	<0.001

**Table 6: Correlation (r value) between basic characteristics and outcome measures at three different periods (n=56)**

Basic characteristics	Total serumprotein concentration (g/dL)		
	Baseline	Moderate exercise	Severe exercise
Age (yrs)	-0.17 <sup>ns</sup>	-0.21 <sup>ns</sup>	0.07 <sup>ns</sup>
Sex	-0.28 <sup>*</sup>	-0.38 <sup>**</sup>	0.27 <sup>*</sup>
Height (cm)	-0.15 <sup>ns</sup>	-0.31 <sup>*</sup>	0.21 <sup>ns</sup>
Weight (kg)	-0.04 <sup>ns</sup>	-0.22 <sup>ns</sup>	0.27 <sup>*</sup>
BMI (kg/m <sup>2</sup> )	0.08 <sup>ns</sup>	0.04 <sup>ns</sup>	0.16 <sup>ns</sup>
SBP (mmHg)	-0.11 <sup>ns</sup>	-0.14 <sup>ns</sup>	0.10 <sup>ns</sup>
DBP (mmHg)	-0.05 <sup>ns</sup>	-0.15 <sup>ns</sup>	0.38 <sup>**</sup>

ns- p>0.05, \*- p<0.05, \*\*- p<0.01, \*\*\*- p<0.001

### Discussion

Physical exercise is undoubtedly a proven stimulus to the secretion of many hormones including cortisol playing an important role in the synthesis of amino acids and proteins. It affects the metabolism of several proteins crucial to human life. The demographic profile of all the subjects was comparable as all the 56 subjects belonged to the same race and were of comparable age group.

The mean total serum protein decrease after moderate exercise while increase after severe exercise as compared to baseline. Comparing the mean total serum protein level of three group/periods, ANOVA showed significantly different total serum protein level among the groups (F=20.12, p<0.001).

While comparing, the mean total serum protein level between the groups, Student ‘t’ test and Tukey test showed significantly different and lower (9.9%) total serum protein level after moderate exercise (p<0.01)

and higher (7.9%) at after severe exercise (p<0.05) as compared to baseline. Further, the mean total serum protein level also increase (17.0%) significantly at after severe exercise as compared to at after moderate exercise (p<0.001). The level of endurance changes with the serum protein levels of test subjects.

There are potential limitations and confounding factors in this investigation which may have impacted the results and potentially limit the reliability and validity of the findings. First, some subjects completed their trials in the morning while others completed their trials in the afternoon, potentially causing differing responses between subjects; although, each respective subject did consistently replicate the time of day for each of their trials. Second, it was relied on the truthfulness of the subjects in providing background information and adhering to experimental compliance procedures, including: medical information, training history, dietary records, acute training (no strenuous exercise in the 24 hours prior to the trials), diet (4 hours post prandial, and no alcohol, NSAIDs, or caffeine in the previous 8 hours). There is either a delay in muscle protein release by damaged muscle fibers, or the proteins are unable to leave the interstitial area for the 24 to 48 hour period after exercise. Because of the long delay, care should be taken when blood protein levels are interpreted in persons who have exercised strenuously (even if only for a short period of intense effort) several days before any diagnostic tests are performed.

Inaccuracies in the information and/or procedures may have introduced systematic error into the study and confounded outcomes. The collection of samples of serum may have also introduced error into study. The drawback of blood sampling is that venipuncture can elicit stressful responses that could lead to rapidly elevated blood cortisol levels. This ‘white-coat’ effect cannot be disregarded if testing is carried out, where personnel are unfamiliar both the testing situation and situations where subjects remain in anticipation of the venipuncture. Although in the present study, subjects rested for 30 minutes before the first blood sample was taken as well as experienced the procedure on four separate occasions, which might have mitigated some of this effect.

We have tried to control all of these factors through sufficient planning, dialogue with the subjects, and collection in controlled environment; nonetheless, errors and oversights may still have occurred. Thus, according to our study, there is correlation of the serum cortisol



levels and the serum total protein according to the grades of exercise but still larger and long-term studies are needed to establish this association.

Similar to our study, Moderate exercise does not alter the total protein level while other serum proteins are decreased, is also reported Adedapo KS et al (2009)<sup>[11]</sup>.

However Nosaka K et al (1997)<sup>[12]</sup> have also noticed the increase in serum total protein after vigorous exercise. The increase in level of serum protein after vigorous exercise as our results indicate

### Conclusion

The serum protein level also decreased after moderate exercise both in males and females but increased in males after severe exercise while no significant change in serum protein in females was observed after severe exercise. The mean total serum protein was significantly higher in lower height and lower weight as compared to higher height (>165 cm) and higher weight (>60 kg). More research is needed for better understanding of serum protein in different time periods (for example, one hour, four hours, and 48 hours after exercise) to measure possible changes following acute combination exercise. Thus, according to our study, there is correlation of the serum total protein according to the grades of exercise but still larger and long-term studies are needed to establish this association.

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** Given by Institutional Ethics Committee of the college.

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# Effect of Various Grades of Exercise on Serum Cortisol

TriptiTripathi<sup>1</sup>, SonaliSaxena<sup>2</sup>, Saurabh Saha<sup>3</sup>, JalajSaxena<sup>4</sup>,  
Dolly Rastogi<sup>5</sup>, Chitra Srivastava<sup>6</sup>, Preeti Kanowjia<sup>7</sup>

<sup>1</sup>Assistant Professor (Physiology), <sup>2</sup>Associate Professor (Medicine), <sup>3</sup>Associate Professor (Physiology), <sup>4</sup>Professor & Head (Physiology), <sup>5</sup>Professor (Physiology), <sup>6</sup>Associate Professor (Physiology), <sup>7</sup>Assistant Professor (Physiology), Department of Physiology, G.S.V.M. Medical College, Kanpur.

## Abstract

Increasing incidence and prevalence of chronic diseases are mostly due to improving socio-economic status and changes in modern lifestyles, including diets which are high in salt, sugar, and undesirable fats and decrease in physical activity levels in Indian population. The present study evaluates the effect of various grades of exercise on serum cortisol in healthy young Indian adults. The objective of the study was to evaluate the pre and post exercise changes in serum cortisol levels. A total 56 healthy First year MBBS student's age between 18-27 yrs of either sex were taken at G.S.V.M. Medical College Kanpur. The subjects were treated with moderate and heavy exercise. Pre-exercise determination of serum total cortisol of all the subjects was done. Post-exercise determination of serum total cortisol of all the subjects after duration of one week and 12 weeks of exercise was done. After completion of 12 weeks of exercise a comparison was made between pre and post exercise values of total serum cortisol. Statistical Analysis was done by paired student 't' test and 95% level of confidence was taken significant ( $p < 0.05$ ). Results indicated that Serum cortisol varies with different grades of exercise and there was slight increase in serum cortisol concentration after moderate exercise but it was of not very much significance. There are some divergent findings also and most literature has cited that an approximate 60% exercise intensity threshold is necessary to elicit a significant increase in blood cortisol. Thus, according to our study, there is correlation of the serum cortisol levels according to the different grades of exercise.

**Keywords:** Serum Cortisol, Exercise.

## Introduction

Physical exercises prevent aging, strengthen muscles and the cardiovascular system, help in weight loss and boost the immune system and helps prevent "diseases of affluence" such as cardiovascular disease, type 2 diabetes and obesity Stampfer M J et al(2000)<sup>[1]</sup>. The physical exercises may be aerobic and anaerobic. The dynamic and static terms are also used in physical exercise. Many other terms such as light, moderate/

mild and severe/vigorous exercise have also been used depending upon the energy intake by Carol Ewing Garber (2011)<sup>[2]</sup>.

Cortisol, a 21 -carbon steroid hormone, the main glucocorticoid form in humans, is a catabolic hormone secreted from the adrenal cortex in response to physical and psychological stress. Cortisol is produced in the human body by the adrenal gland in the zona fasciculata, the second of three layers comprising the adrenal cortex. The cortex forms the outer "bark" of each adrenal gland, situated atop the kidneys.

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### Corresponding Author:

**Dr. Saurabh Saha**

Associate Professor, Department of Physiology,  
G.S.V.M. Medical College, Kanpur  
e-mail: drsahagsvm@gmail.com

Of all the cortisol about 70% is bound to cortisol binding globulin, 20% to albumin and the rest is free. The free cortisol is the biologically active form with a half life of 30-90 minutes. Secretion of cortisol is controlled by the hypothalamus and the pituitary gland,

parts of the brain that are important in many other body functions as ascertained by Burtis A et al (2013)<sup>[3]</sup>.

In response to the stress of exercise, cortisol plays many roles in helping the body to modify and adapt to the stress. It also includes: the mobilization of free fatty acids (FFA) from adipose tissue, protein catabolism, stimulation of gluconeogenesis at the liver, and inhibition of glucose uptake by the working skeletal muscle by Brooks et al (2000)<sup>[4]</sup>. All these responses increase the exercise capacity and aid in recovery and adaptation Viru et al (2007)<sup>[5]</sup>. There is a “threshold intensity” resulting in significant elevations in circulating cortisol. In one such study by Davies et al (1973)<sup>[6]</sup> observed that an exercise intensity of 50-60% of VO<sub>2</sub>max must be reached for cortisol to be increased and the absolute levels attained during exercise are dependent on the total duration of the exercise bout.

Cortisol increases alternate fuels for muscle, such as fatty acids and amino acids (from muscle amino acid stores and protein catabolism), impairs glucose entry into skeletal muscle, and supplies the fuels (amino acids) for the liver to increase glucose production. All these functions are increased during times of low body carbohydrate nutrition, such as when blood glucose falls. Thus, when doing prolonged aerobic exercise, the muscle catabolic effects of cortisol can be diminished simply by maintaining blood glucose, which in turn is best done through the ingestion of carbohydrate (liquid and/or solid).

## Materials and Method

The present study was carried out on 56 Subjects including 28 males and 28 female students of 1<sup>st</sup> year M.B.B.S in the Department of Physiology at G.S.V.M. Medical College, Kanpur. This cross sectional pilot study include 18 to 27 years old students. All the physical parameters like age (years), Height (cms), Weight (Kgs) and blood pressure (mm Hg) were recorded initially in all subjects. The subjects were told about the study and their written consent was taken.

The subjects were also divided into two groups based on BMI (Body Mass Index) to see, if there exit any correlation between the serum cortisol and BMI.

After subject characteristics were assessed, they were instructed to warm-up on the by cycle ergometer for 5 minutes at a very light workload. At this time, the seat height was adjusted to the optimal height and

comfort. The light warm up was followed up by 5 minutes of stretching, primarily emphasizing the torso and the lower extremities. The subject was subsequently properly fit with a mouthpiece and oxygen uptake which was used to make sure that the values were normal and the metabolic system was functioning properly.

The workload was then increased at the end of the 3 minute intervals (stages) until volitional fatigue. The target of the exercise was to achieve a heart rate 125-130 beats/minute (severe exercise) and it was achieved in 10 to 15 minutes by doing the cycling without any extra load. The brink of exhaustion after 10 minutes of exercise was taken as end point of the exercise for that subject.

The baseline readings of total serum cortisol and serum total protein were taken before exercise. The subjects were then asked to do various grades of exercise on alternate day basis under supervision. Total serum cortisol and total serum proteins were then measured followed by measurement of the total serum cortisol after exercise.

The reported workloads were mean values calculated over the duration of the 30 minutes of exercise.

The subjects were divided into two groups after defining their body mass index (BMI) and classified as

**Non-obese group with BMI < 25 kg/m<sup>2</sup>**

**Obese group with BMI ≥ 25 kg/m<sup>2</sup>**

The first blood samples (3 mL) as baseline, after placement of a catheter, were collected using a 3-cc syringe (Vanishpoint) and a 25 gauge needle (Retractable Technologies, Inc., TX, USA) in the morning between 9 a.m.- 2.00 p.m.

The plasma was pipetted into cryo-freeze tubes and stored at -80 °C degrees Celsius in an ultra freezer.

After the blood sample was taken, subjects were allowed to actively cool down on the cycle ergometer, followed by a resting period. After 30 minutes recovery post-exercise, moderate and severe exercise were done by subjects with Heart rate (HR) reaching > 25 ± 50 and > 50 respectively of the baseline HR. Then last blood samples were collected.

Total serum cortisol was measured using Enzyme linked immunosorbent assay (ELISA) at the Department

of Pathology, G.S.V.M. Medical College Kanpur. The cortisol ELISA kit was used for the quantitative in vitro diagnostic measurement of cortisol in the serum. The cortisol ELISA kit is a solid phase Enzyme-linked immunosorbent assay (ELISA), based on the principle of competitive binding.

The significance of the standard errors of means between the different sets of observations have been assessed by applying paired student ‘t’ test and 95% level of confidence (p<0.05).

**Observations and Results**

These investigations were made on fifty six medical students (28 males and 28 females) out of 190 M.B.B.S. students who volunteered for this study as subjects. The age of subjects ranged from 18-27 years. Pre-exercise determination of serum total cortisol of all the subjects was done before the training was started. The baseline data of each subject was recorded. Post-exercise determination of serum total cortisol of all the subjects after duration of one week and 12 weeks of exercise was done. After completion of 12 weeks of exercise a comparison was made between pre and post exercise values of total serum cortisol.

The pre (baseline) and post exercise (moderate and severe) serum cortisol concentration (ng/dL) of all subjects is summarised in Table showed that the mean serum cortisol increased after moderate exercise while it decreased after severe exercise as compared to baseline. Comparing the mean serum cortisol level of the three groups (baseline, after moderate exercise and severe exercise), ANOVA showed significantly different serum cortisol level among the groups (F=3.82, p<0.05).

Further, comparing the mean serum cortisol level between the groups, Student ‘t’ test and Tukey test showed similar serum cortisol level after moderate exercise (7.79 ± 0.28 vs. 8.13 ± 0.28, mean difference=0.34, q=1.19, p>0.05) and severe exercise (7.79 ± 0.28 vs. 7.04 ± 0.29, mean difference=0.75,

q=2.63, p>0.05) as compared to baseline though it was increased 4.2% and decreased 9.6% respectively (Table 7 and Fig. 15). However, the mean serum cortisol level decrease (13.4%) significantly after severe exercise as compared to after moderate exercise (8.13 ± 0.28 vs. 7.04 ± 0.29, mean difference=1.09, q=3.82, p<0.05).

The mean serum cortisol level over the periods/groups were also compared according to gender and summarised in **Table 1**. After exercise, the mean serum cortisol level decreased in females while it was increased in males. Comparing the mean serum cortisol level between the periods, Student ‘t’ test and Tukey test showed significant (p<0.05 or p<0.01) decrease in serum cortisol level in females at severe exercise as compared to both baseline and moderate exercise while in males it did not differed significantly (p<0.05) (**Table**). Comparing the mean serum cortisol level between the genders, Student ‘t’ test and Tukey test showed significantly (p<0.05 or p<0.001) different and higher serum cortisol level in males as compared to females at both moderate and severe exercise while it did not differ (p>0.05) at baseline i.e. found to be statistically the same.

**Table 1: Pre and post exercise serum cortisol concentration (ng/dL) of all the subjects**

Groups/Periods	Mean±SE (n=56)	F value	P Value
Baseline	7.79±0.28	3.82	<0.05
After moderate exercise	8.13±0.28	3.82	<0.05
After severe exercise	7.04±0.29		

**Table 2 : Pre and post exercise serum cortisol level (ng/dL) (Mean ± SE) according to gender**

Groups/Periods	Female (n=28)	Male (n=28)	p value
Baseline	7.72±0.37	7.87±0.42	1.000
After moderate exercise	7.28±0.41	8.99±0.33	0.015
After severe exercise	5.82±0.33	8.27±0.36	<0.001

**Table 3: Correlation (r value) between basic characteristics and outcome measures at three different periods (n=56)**

Basic characteristics	Heart rate (beats/min)			Serum cortisol concentration (ng/dL)		
	Baseline	Moderateexercise	Severeexercise	Baseline	Moderateexercise	Severeexercise
Age (yrs)	-0.07 <sup>ns</sup>	0.01 <sup>ns</sup>	-0.04 <sup>ns</sup>	-0.17 <sup>ns</sup>	0.15 <sup>ns</sup>	0.09 <sup>ns</sup>
Sex	-0.23 <sup>ns</sup>	-0.26 <sup>ns</sup>	-0.11 <sup>ns</sup>	0.04 <sup>ns</sup>	0.41 <sup>**</sup>	0.56 <sup>***</sup>

Basic characteristics	Heart rate (beats/min)			Serum cortisol concentration (ng/dL)		
	Baseline	Moderateexercise	Severeexercise	Baseline	Moderateexercise	Severeexercise
Height (cm)	-0.03 <sup>ns</sup>	-0.03 <sup>ns</sup>	0.04 <sup>ns</sup>	0.02 <sup>ns</sup>	0.37 <sup>**</sup>	0.30 <sup>*</sup>
Weight (kg)	-0.05 <sup>ns</sup>	-0.10 <sup>ns</sup>	-0.03 <sup>ns</sup>	-0.12 <sup>ns</sup>	0.19 <sup>ns</sup>	0.21 <sup>ns</sup>
BMI (kg/m <sup>2</sup> )	-0.03 <sup>ns</sup>	-0.12 <sup>ns</sup>	-0.09 <sup>ns</sup>	-0.18 <sup>ns</sup>	-0.11 <sup>ns</sup>	-0.01 <sup>ns</sup>
SBP (mmHg)	-0.15 <sup>ns</sup>	-0.06 <sup>ns</sup>	0.09 <sup>ns</sup>	-0.01 <sup>nd</sup>	-0.02 <sup>ns</sup>	0.20 <sup>ns</sup>
DBP (mmHg)	-0.24 <sup>ns</sup>	-0.16 <sup>ns</sup>	0.10 <sup>ns</sup>	-0.25 <sup>nd</sup>	-0.13 <sup>ns</sup>	0.09 <sup>ns</sup>

ns- p>0.05, \*- p<0.05, \*\*- p<0.01, \*\*\*- p<0.001

### Serum cortisol concentration (ng/dL)

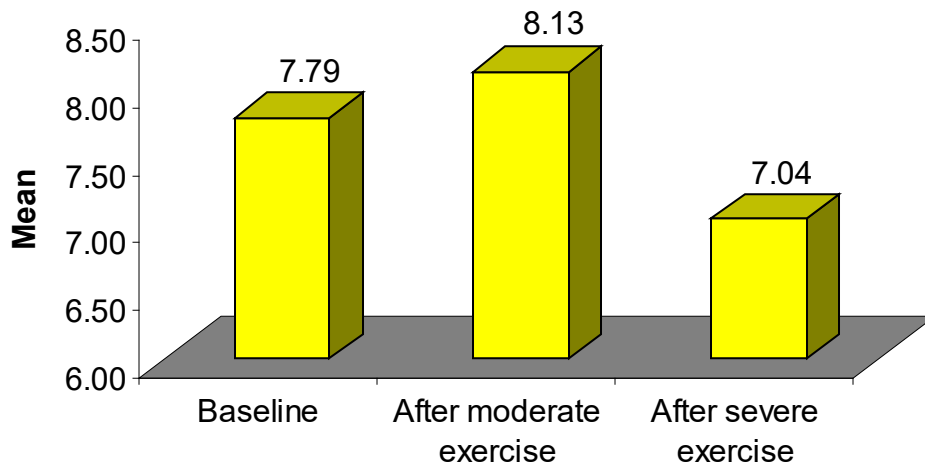


Figure 1. Comparison of mean serum cortisol level between two group

### Serum cortisol concentration (ng/dL)

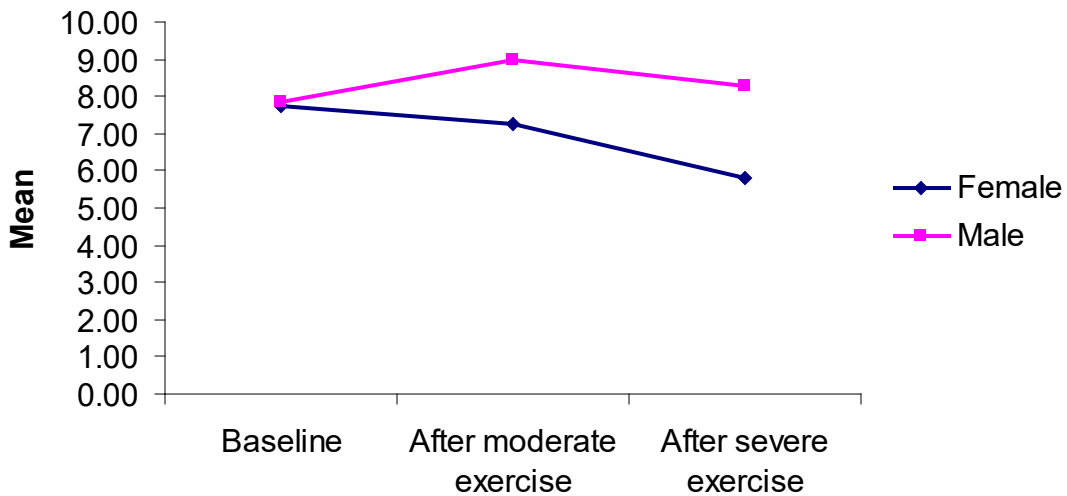


Figure 2. Mean serum cortisol level of males and females over the periods

**Table 4: Association between basic characteristics and outcome measures after moderate exercise (n=56)**

Basic characteristics	N	HR (beats/min)			Serum cortisol concentration (mmol/L)		
		Mean±SE	t value	p value	Mean±SE	t value	p value
Age (yrs):	47	119.85±1.65	0.53	0.598	7.90±0.31	1.91	0.061
≤20	9	121.89±1.53			9.35±0.54		
>20							
Sex :			2.01	0.049	7.28±0.41	3.26	0.002
Female	28	122.93±2.03			8.99±0.33		
Male	28	117.43±1.82					
Height (cm) :			0.44	0.661	7.63±0.36	2.11	0.039
≤165	32	120.72±2.21			8.81±0.43		
>165	24	119.46±1.47					
Weight (kg) :			1.49	0.143	7.65±0.39	1.87	0.067
≤60	30	122.10±2.09			8.69±0.40		
>60	26	117.96±1.77					
BMI (kg/m <sup>2</sup> ) :			0.49	0.630	8.05±0.30	0.69	0.495
<25	48	120.46±1.59			8.62±0.85		
≥25	8	118.50±2.54					
SBP (mmHg) :			0.47	0.643	8.13±0.34	0.06	0.952
≤120	44	120.52±1.66			8.17±0.50		
>120	12	118.92±2.49					
DBP (mmHg) :			0.62	0.537	8.19±0.33	0.36	0.722
≤80	44	120.64±1.63			7.94±0.59		
>80	12	118.50±2.75					

Serum cortisol were found significantly associated to height.

**Table 5: Association between basic characteristics and outcome measures after severe exercise (n=56)**

Basic characteristics	N	HR (beats/min)			Serum cortisol concentration (mmol/L)		
		Mean±SE	t value	p value	Mean±SE	t value	p value
Age (yrs) : ≤20	47	141.81±1.54	1.19	0.240	6.89±0.31	1.18	0.244
>20	9	146.89±5.70			7.83±0.86		
Sex :			0.80	0.426	5.82±0.33	5.02	<0.001
Female	28	143.89±2.56			8.27±0.36		
Male	28	141.36±1.85					
Height (cm) :			1.03	0.307	6.23±0.37	3.52	<0.001
≤165	32	141.22±2.23			8.13±0.38		
>165	24	144.50±2.15					
Weight (kg) :			1.66	0.104	6.58±0.38	1.73	0.090
≤60	30	140.23±2.23			7.58±0.44		
>60	26	145.38±2.13					
BMI (kg/m <sup>2</sup> ) :			0.61	0.543	6.94±0.33	0.91	0.366
≤25	48	143.02±1.81			7.70±0.62		
>25	8	140.25±1.97					
SBP (mmHg) :			0.37	0.713	6.93±0.35	0.76	0.449
≤120	44	142.32±1.76			7.47±0.49		
>120	12	143.75±3.63					
DBP (mmHg) :			0.65	0.521	7.00±0.34	0.29	0.771
≤80	44	142.09±1.74			7.21±0.58		
>80	12	144.58±3.75					

The serum cortisol level was found significantly associated to sex and height.

## Discussion

Serum total cortisol level after moderate and high intensity exercise showed that during moderate exercise, there was slight increase in cortisol level but it was of not very much significance. There are some divergent findings also and most literature has cited that a ~60% exercise intensity threshold is necessary to elicit a significant increase in blood cortisol Davies & Few(1973)<sup>[6]</sup> and Hill et al (2008)<sup>[7]</sup>. Similar observations have also been noticed by Suzan s. et al (2013)<sup>[8]</sup> where they did not find any significant change after moderate and sever exercises. Bloom et al (1976)<sup>[9]</sup> and Viru and Viru (2004)<sup>[10]</sup> have observed that persons who are highly trained tend to have a higher intensity threshold to provoke an increase in cortisol.

The decrease in cortisol concentration in serum after severe exercise was not expected. Why this change occurred is unclear, but it could reflect the circadian pattern of cortisol secretion and/or a natural decline in the hormonal levels as a function of feedback regulation Few et al (1970)<sup>[11]</sup> and Kerrigan et al (1993)<sup>[12]</sup>. The lack of a significant Cortisol response to the resistance exercise protocols may have been due to the time of blood sampling or the amount of rest periods between sets. Methodological flaws in the assay procedures are not a likely factor.

## Conclusion

Serum total cortisol level of the subjects before exercise was  $7.79 \pm 0.28$  ng/dL (Mean  $\pm$  S.E) and after moderate exercise the serum cortisol was  $8.13 \pm 0.28$  ng/dL (Mean  $\pm$  S.E) while after severe exercise the serum cortisol was  $7.04 \pm 0.29$  ng/dL (Mean  $\pm$  S.E).

1. Serum total cortisol level of the male subjects before exercise was  $7.87 \pm 0.42$  ng/dL (Mean  $\pm$  S.E) and after moderate exercise the serum cortisol was  $8.99 \pm 0.33$  ng/dL (Mean  $\pm$  S.E) while after severe exercise the serum cortisol was  $8.27 \pm 0.36$  ng/dL (Mean  $\pm$  S.E).
2. Serum total cortisol level of the female subjects before exercise was  $7.72 \pm 0.37$  ng/dL (Mean  $\pm$  S.E) and after moderate exercise the serum cortisol was  $7.28 \pm 0.41$  ng/dL (Mean  $\pm$  S.E) while after severe exercise the serum cortisol was  $5.82 \pm 0.33$  ng/dL (Mean  $\pm$  S.E).
3. The serum cortisol level according to BMI ranged from ranged from 4.93 to 10.05 ng/dL with a mean

of  $6.76 \pm 0.86$  ng/dL (Mean  $\pm$  S.E) in obese group (BMI  $\geq 25$  kg/m<sup>2</sup>) before exercise and after moderate exercise the serum cortisol level ranged from 5.89 to 10.67 with a mean of  $8.62 \pm 0.85$  ng/dL (Mean  $\pm$  S.E) while after severe exercise the serum cortisol level ranged from 5.33 to 10.12 ng/dL with a mean of  $7.83 \pm 0.62$  ng/dL (Mean  $\pm$  S.E) 10.95 in obese group.

4. The serum cortisol level according to BMI ranged from ranged from 3.21 to 11.09 ng/dL with a mean of  $7.97 \pm 0.29$  ng/dL (Mean  $\pm$  S.E) in non-obese group (BMI  $< 25$  kg/m<sup>2</sup>) before exercise and after moderate exercise the serum cortisol level ranged from 3.14 to 10.95 with a mean of  $8.05 \pm 0.30$  ng/dL (Mean  $\pm$  S.E) while after severe exercise the serum cortisol level ranged from 5.15 to 11.16 ng/dL with a mean of  $6.94 \pm 0.33$  ng/dL (Mean  $\pm$  S.E) in non-obese group.

It was also observed that mean serum cortisol level was significantly higher in subjects with higher height ( $>165$  cm) as compared to lower height ( $\leq 165$  cm) ( $7.63 \pm 0.36$  vs.  $8.81 \pm 0.43$ ,  $t=2.11$ ,  $p=0.039$ ).

Thus, according to our study, there is correlation of the serum cortisol levels according to the grades of exercise but still larger and long-term studies are needed to establish this association.

**Conflict of Interest:** No

**Source of Funding:** Self

**Ethical Clearance:** Given by Institutional Ethics Committee of the college.

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# The Study of Neuropsychological Functions in Myopes, Following an Intervention of Trataka Yoga Kriya

Uday K. Dixit<sup>1</sup>, Sushma S.<sup>2</sup>

<sup>1</sup>Third Year MBBS Student, <sup>2</sup>Assistant Professor, Department of Physiology, Bangalore Medical College and Research Institute, Fort, K.R. Road, Bangalore-560 002, Karnataka

## Abstract

**Aim of Study:** To evaluate the effects of Trataka yoga on neuropsychological functions in myopic subjects.

**Methodology:** Out of 36 myopes recruited for the study, 25 subjects were considered for statistical analysis. Digit Span Test and Complex Figure test were measured before and after an intervention of Trataka yoga kriya for 3 weeks.

**Results:** In the present study, post Trataka yoga kriya intervention, Complex figure test results showed an increase in mean scores from 31.32 to 34.20 and Digit span test results showed an increase in mean scores from 7.32 to 7.96, which was found to be statistically significant.

**Conclusion:** Our study concluded that Trataka yoga has a significant effect on neuropsychological functions in myopes. Further regular Trataka yoga kriya practice can be used as an inexpensive, simple and non-pharmacological means as a protective factor against cognitive deterioration.

**Keywords:** Myopes, Trataka yoga, Neuropsychological functions.

## Introduction

Myopia is one of the most prevalent disorders of the eye and is associated with comorbidities with an estimated 22.9% of the world population, being affected.<sup>1</sup> An additional 2.7% of people are estimated to have high myopia.<sup>2</sup> The economic impact of uncorrected refractive error is estimated to be a loss of \$202 billion of global gross domestic product. In 2010, just over 28% of the world's population were affected by Myopia. This is predicted to rise to 34% by 2020 and nearly 50% by 2050.<sup>3</sup>

Cognitive functions also termed Neuro Psychological functions are the particular psycho mental processes within a person's psyche that are present regardless of common circumstance.<sup>4</sup> Older myopics were almost twice as likely to have cognitive dysfunction when compared with individuals with emmetropia<sup>5</sup> due to amyloid and acetyl choline deficiency.

Trataka Yoga Kriya is a form of Yoga believed to improve eyesight and strengthen ocular muscles. Many studies have proved that yoga is effective to improve various cognitive functions such as remote memory, mental balance, attention and concentration, attention span, processing speed, attention alternation ability, and recognition tests in the healthy young subjects.<sup>6</sup>

However, a very few studies have been able to relate the cognitive abilities involving visuospatial memory skills and refractive error in myopes. The purpose of our study is to evaluate this possible association in myopics aged 18 to 25 years following a non-pharmacological intervention of Trataka yoga kriya.

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### Corresponding Author:

**Dr. Sushma S.**

Assistant Professor, Department of Physiology,  
Bangalore Medical College and Research Institute,  
Fort, K.R. Road, Bengaluru-560002  
e-mail: suvina76@gmail.com  
Phone: 9916915194

Digit span scores and cognitive functions improved immediately after the practice of Trataka in the healthy elderly subjects.<sup>7</sup> Another study by Raghavendra et al has seen positive changes in the Neuropsychological functions of subjects post intervention of Trataka Yoga Kriya<sup>8</sup>. Anna H et al have studied the use of EEG oscillations to predict cognitive status in a cohort of healthy males with varying cognitive ability.<sup>9</sup>

**Aims and Objectives:** To study the effects of Trataka yoga kriya on the Neuropsychological functions in myopes.

## Material and Method

**Study design:** Pre and Post intervention study.

**Study period:** August 2019 and October 2019

**Place of study:** Dept. of Physiology, BMCRI.

**Study group:** The study was conducted on 36 subjects prediagnosed with myopia.

**Sample size:** 36 subjects prediagnosed with myopia

### Inclusion Criteria:

1. Subjects in the age group of 18 and 25 years.
2. Subjects pre-diagnosed with Myopia.

### Exclusion Criteria:

1. History of any ocular surgery
2. History of any ocular pathology
3. Subjects with colour blindness.
4. Subjects with history of seizures
5. History of neurological/psychiatric and other systemic diseases
6. Subjects who had received yoga training in the previous 3 months.

**Methodology:** Written informed consent was obtained from the recruited subjects after explaining the procedure in detail. The subjects were selected based on inclusion and exclusion criteria and their base line data was recorded.

### Assessment of Neuropsychological Functions:

A cognitive function involving visuospatial skills was tested by Complex Figure Test and working memory for sustained attention was tested by digit span test.

**Complex Figure Test or Rey-Osterrieth Complex figure test:** The Rey-Osterrieth Complex Figure Test (ROCF) is a widely used neuropsychological test for the evaluation of visuospatial constructional ability and visual memory. The ROCF consists of three test conditions: Copy, Immediate Recall and Delayed Recall. At the first step, subjects were given the ROCF stimulus card, and then asked to draw the same figure. Subsequently, they were instructed to draw what they remembered. Then, after a delay of 30 min, they were required to draw the same figure once again. The results were scored according to location, accuracy and organization. Each condition of the ROCF takes 10 min to complete and the overall time of completion is about 30 min.<sup>10</sup>

**Digit Span Test:** The Digit Span (DS) is a subtest in Wechsler Adult Intelligence Scale-third edition (WAIS-III) and has been standardized for use in an Indian population.<sup>11</sup>

A digit-span task is used to measure working memory's number storage capacity. Subjects were shown a sequence of numerical digits and were tasked to recall the sequence correctly, with increasingly longer sequences being tested in each trial. The longest number of sequential digits that can accurately be remembered is the digit span of the subject. Digit-span tasks are the most commonly used test for memory span, partially because performance on a digit-span task cannot be affected by factors such as semantics, frequency of appearance in daily life, complexity, etc.<sup>12</sup>

### Trataka Yoga Kriya And Related Eye Exercises:

After measuring the cognitive ability an intervention of Trataka yoga kriya<sup>13</sup> and a set of eye exercises was be given for a period of 3 weeks. It includes gazing at the candle flame with focused attention followed by defocusing, breathing and chanting. Each session was for 30 min duration and was conducted on everyday basis.

### The preparatory Eye Exercises include

- Left and Right movements
- Up and Down movements
- Clockwise and anticlockwise Circular movements
- Simple Palming
- Simple and Intermittent Pressure application
- Palming with Brahmari

The form of Trataka which was practised is the Jyothi Trataka. The subjects were asked to sit 3 feet from a candle flame in a dimly lit room. They were asked to gaze and focus effortlessly and later intensively on the outer part and later the inner parts of the flame with intermittent chanting. In between the exercises simple palming was done to relax the eyes.

#### I. Statistical analysis:

Data was entered in Microsoft Excel and spss version 24.0 was used for statistical analysis. Data was analysed by descriptive statistics such as mean, median, standard deviation and interquartile range, percentage, tables and graphs wherever necessary. Student 't' test was used to determine significant difference in neuropsychological functions between pre and post intervention.

### Observation and Results

Of the total 36 subjects, 25 subjects (with a mean power of left and right eyes being  $2.29 \pm 1.92$  and

$2.52 \pm 1.97$  respectively both male and female in the ratio of 17:8 with a mean age of 20 years)(Table 1) completed the intervention and were considered for the study. All 25 subjects had successfully completed 3 weeks of yoga intervention and were asked to continue the practice till the readings required for the study were completed.

Pre-intervention tests showed a Complex figure test result mean of 31.31 with SD of 2.60 and digit span test results had a mean of 7.31 with a SD of 0.79.(Fig 1) (Table 1)

Post-intervention Complex figure test results showed a mean of 34.20 with SD of 2.04 and Digit span test results showed a mean of 7.96 with SD of 0.79.(Fig 2) (Table 1)

Paired sample tests show a mean increase of  $2.88 \pm 2.74$  and  $0.64 \pm 0.86$  between pre intervention and post intervention for Complex Figure Test and Digit Span Test respectively both of which are significant. (Table 2).

**Table 1: Pre and Post intervention Comparison**

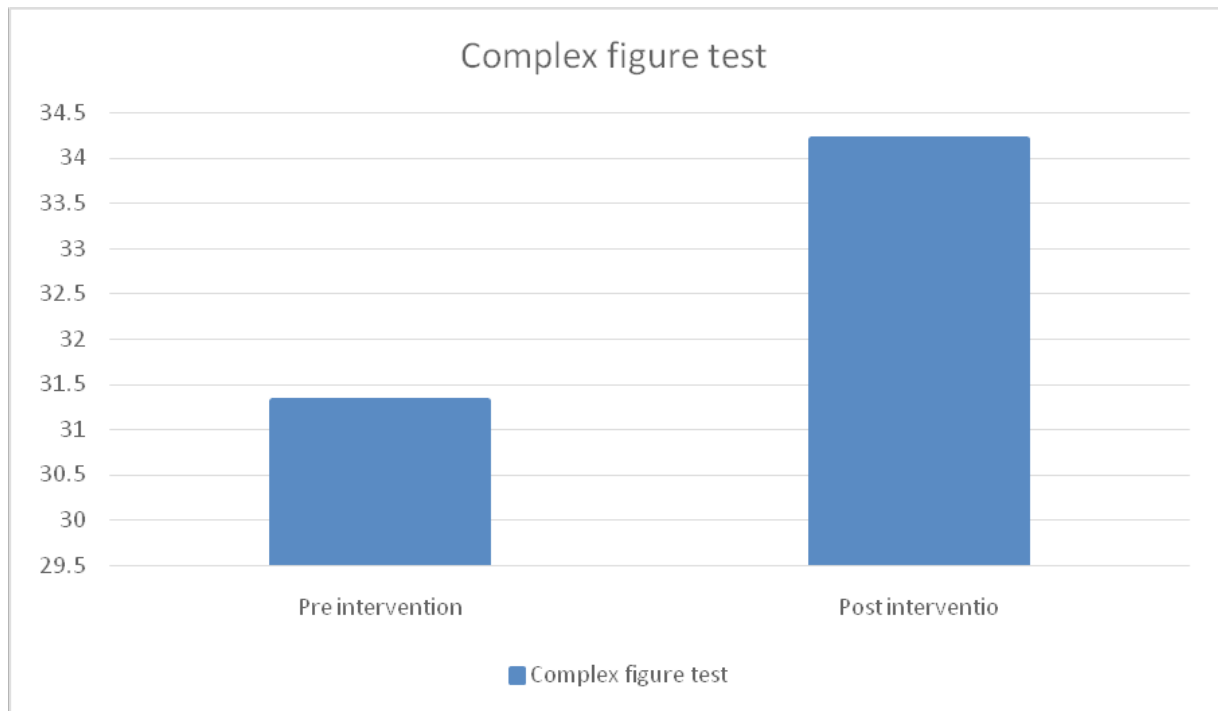
Parameter	Pre intervention	Post intervention	Sig (2 tailed)
Male : Female ratio*	17:8		
Power (left)(D)*	$2.29 \pm 1.92$		
Power (Right)(D)*	$2.52 \pm 1.97$		
Complex figure test (max-36)	$31.32 \pm 2.66$	$34.20 \pm 2.04$	0.000
Digit span test	$7.32 \pm 0.80$	$7.96 \pm 0.79$	0.001

\*Parameters were not considered for post interventional analysis

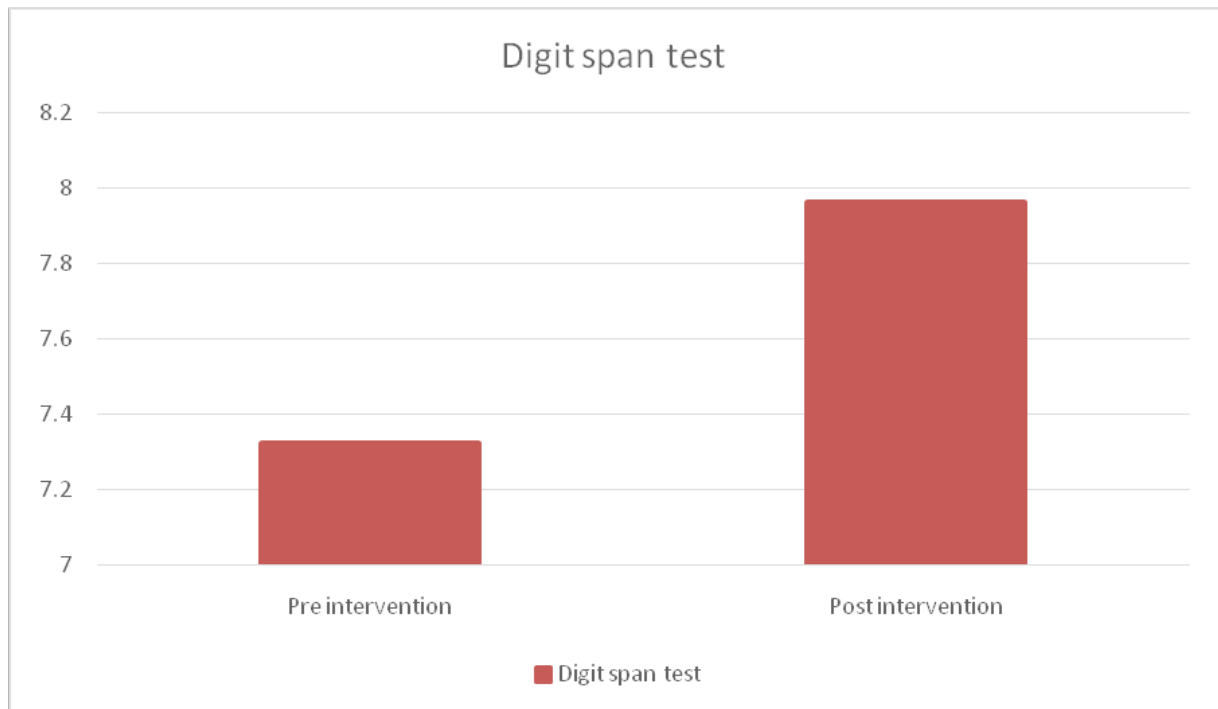
**Table 2: Paired Sample Tests**

Test (Pre-Post)*	Paired Differences	
	Mean	Sig (2-tailed)
Complex figure test	$-2.88 \pm 2.74$	0.000
Digit Span Test	$-0.64 \pm 0.86$	0.001

\*The difference between Pre intervention and Post intervention test results is calculated and significance is determined.



**Fig. 1: Mean Complex Figure Test scores**



**Fig. 2: Mean Digit Span Test scores**

### Discussion

The results of the present study demonstrated that Trataka intervention significantly correlated with a better cognitive function score (reflected by improved working memory for sustained and focused attention, visio-

spatial skills for visual memory for executive functions). The results are consistent with the results of earlier studies conducted on elderly subjects who showed that, at the end of 3 month follow-up, yoga group improved in semantic memory, short-term primary memory, and

short-term working memory.<sup>14</sup> Meditation processes are linked to gamma-aminobutyric acid (GABA) ergic cortical inhibition which improved the cognitive performance and enhanced emotional regulation.<sup>15</sup>

Further, meditation may potentially strengthen neuronal circuits and enhance cognitive reserve capacity. Brain regions associated with attention, interception, and sensory processing are thicker in meditation practitioners including the Prefrontal Cortex and right anterior insula.<sup>16</sup>

Recording the refractive error using Autorefractometers could have been proved to show valid and repeatable measures, which we could not precisely measure due to technical restraints. The use of standardized protocols for obtaining cognitive evaluations were followed by single researcher, to increase the test reliability. Though the Trataka intervention period was only for 3 weeks, still we could show significant improvement in cognitive functioning post intervention. This claim however needs to be tested in larger samples with long term intervention, which could have depicted significant changes. Further studies can be conducted to test the effect of Trataka on different neurological test batteries.

By observing the obtained results, the limitations would be lack of a larger sample size, short interventional protocol duration, the Trataka being tiresome for some of the participants to perform, as they were asked to perform the eye exercises in proper repetition.

### Conclusion

The present study concludes a statistically significant improvement in cognitive function scores following Trataka intervention in myopes. Further regular Trataka yoga kriya practice can be used as an inexpensive, simple and non-pharmacological means as a protective factor against cognitive deterioration. Trataka can be practiced independently by the participant to achieve desired results. For researchers, this study could provide a substantial base for conducting future trials to test the efficacy of Trataka to enhance cognition in myopes.

**Acknowledgement:** My heartfelt thanks to all the participants for kindly cooperating during the study. I am grateful to Bangalore Medical College and Research Institute for providing the opportunity and support to the budding doctors in the area of research.

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** Taken

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# Assessment of Learning Outcomes Using Team Based Learning

Abuzer Abdalla<sup>1</sup>, Syed Sadat Ali<sup>3</sup>, Danish Anwer<sup>2</sup>

<sup>1</sup>Lecturer, <sup>2</sup>Assistant Professor, Department of Anatomy, Faculty of Medicine, Jazan University, Jazan, Saudi Arabia, <sup>3</sup>Associate Professor, Department of Physiology, Gujarat Adani Institute of Medical Sciences, KSKV Kachchh University, Bhuj-01, Gujarat

## Abstract

**Background and Objectives:** Team-based learning (TBL) is composed of pre-class self-study, readiness assessment tests individually (iRAT) followed by readiness assessment tests in the team (tRAT), and peer feedback. TBL was implemented in the course of General Embryology for the 2nd year medical students at the Faculty of Medicine, Jazan University (FMJU), KSA, in the Male and Female Sections through the years 2015-2019. This study aims to analyze this experience in two aspects: whether it was implemented accurately maintain uniformity, and whether it achieved the planned outcomes.

**Method:** TBL implementation at FMJU was calibrated against a Logic Model for TBL implementation. Data was obtained from records of students including the number of students, attendance, exam marks, and peer feedback. Description of facilities and faculty was also included.

**Results:** TBL components were applied; multi-disciplinary faculty was involved and an electronic exam replaced paper exam in iRAT, indicating the possibility of improvement. The student shows a high percentage of attendance, high marks in the tRAT compared to tRAT and traditional exams, and high opinion about participation in teamwork.

**Conclusion:** We concluded that TBL implementation was successful in-process and fulfill the intended outcomes.

**Keywords:** Learning-outcomes, TBL, Logic Model, Assessment, Peer feedback, iRAT, tRAT.

## Introduction

Team-based learning (TBL), was first introduced at Baylor College of Medicine in 2001<sup>1</sup>, although the term and concept were first popularized by Larry Michelson, while at the University of Oklahoma in the 1970s. It is a well-defined instructional strategy used in business and science courses. TBL brings together theoretically-based and empirically-grounded strategies for ensuring the effectiveness of small-groups working independently

in classes with high student-faculty ratios (e.g., up to 200:1) without losing the benefits of faculty-led small groups with lower ratios (e.g., 7:1).<sup>2-4</sup>

Team-based learning consists of modules that can be taught in a three-step cycle: preparation, in-class readiness assurance testing, and application-focused exercise.

The implementation of TBL is based on four underlying principles according to Michaelsen & Richards, 2005.<sup>5</sup>

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### Corresponding Author:

**Dr. Syed Sadat Ali**

Associate Professor, Department of Physiology, Gujarat Adani Institute of Medical Sciences, Bhuj-01, Gujarat  
e-mail: drsadataali@gmail.com  
Ph.: +91 99643 18714

1. Groups should be properly formed and groups should have an evenly distributed number of talented people among them. According to Michaelsen, most of the reported “problems” with learning groups (free-riders, member conflict, etc.) are the direct result of inappropriate group assignments”.

2. Students are accountable for their pre-learning and teamwork.
3. Team assignments should promote learning and team development.
4. Students must receive frequent and immediate feedback.

This study aims to evaluate TBL implementation in the course of General Embryology for 2nd class, medical students which took place in the Faculty of Medicine, Jazan University (JUFM); Kingdom of Saudi Arabia (KSA). The implementation started more than 5 years ago and is still going on. In Jazan University, like other Saudi universities, there are separate sections for male and female students, so TBL was conducted in the male and female sections separately but at the same time to ensure the confidentiality of assessment. We conduct this thorough analysis to answer the question of whether TBL at JUFM, KSA, was applied properly and reach the intended learning outcomes. Besides, in this year (2019-2020) electronic program to answer tests were added, which was different from the previous 4 years. This might indicate the possibility of improvement of TBL at JUFM a year after year.

## Materials and Method

The TBL project at JUFM was evaluated by a mixed-method model with quantity and quality options, using implicit and quasi designs. Targets are the patches of 2nd-year students in JUFM in the male and female sections through the years 2015-2019. The inclusion criterion applies to registered students in the course of General Embryology (total coverage). Exclusion criteria included students who withdrew from the course. Ethical and departmental confidentiality were considered. Ethical clearance was obtained by Institutional Ethical Committee.

We calibrated the TBL at JUFM against the Logic Model <sup>6,7</sup> for TBL implementation, putting in mind any modification or improvement. The variables were arranged into four categories: inputs, activities/process, output, and outcome. The data was collected using the description of the facility, the human task-force, records of marks, and student peer feedback. Data were analyzed using SPSS for numerical variables. T-test was used for measuring the significant differences.  $P < 0.05$  was considered significant.

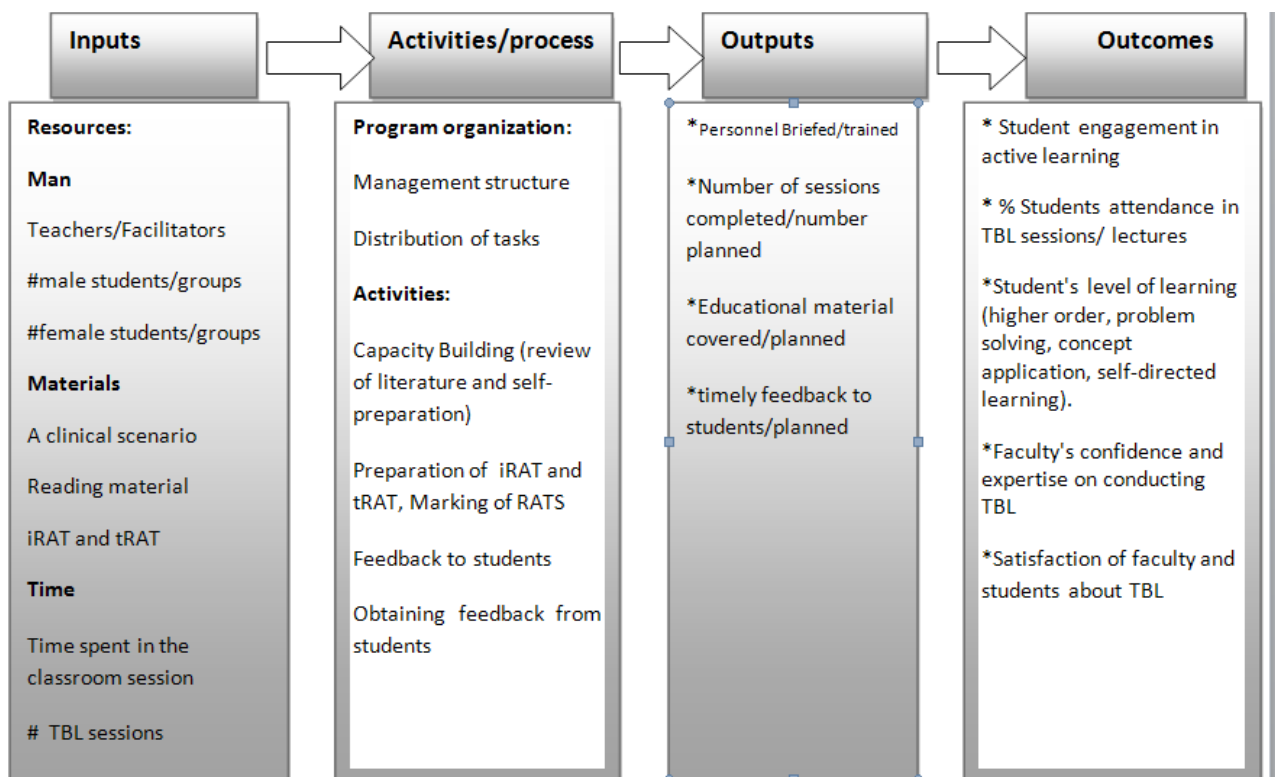


Figure No. 1: Logic model for TBL implementation<sup>[7]</sup>



## Results

The analysis of the TBL project in General Embryology at FMJU covered the following: the TBL process as input; the marks and the student perception as an outcome.

**Components of the TBL process:** These are (1) Description of the Facility, (2) Faculty shared in the preparation and running of TBL (multidisciplinary), (3) students- males and females (4) Study materials (5) the Readiness Assessment Tests (RATs+) (6) time of a session and the number of sessions/year. They are shown in table 1(a) & 1 (b).

### Students Information:

**Table No. 1 (a): Components of the TBL process through years 2015-19**

Component/year	2015	2016	2017	2018	2019
Number of students	Male: 105: Female: 108	Male: 91: Female: 92	Male: 116: Female: 111	Male: 115: Female: 103	Male: 79: Female: 82
% of student attendance in TBL1 session	Male: 90.4: Female: 91.5	Male: 92.3: Female: 97.5	Male: 96.4: Female: 97.3	Male: 95.6: Female: 100	Male: 98.7: Female: 96.3
% of student attendance in TBL2 session	Male: 88.5: Female: 89.5	Male: 94.6: Female: 95.2	Male: 94.2: Female: 97.3	Male: 94.8: Female: 98.0	Male: 96.2: Female: 92.7:
No of groups of students	Male: 10: Female: 10	Male: 10: Female: 10	Male: 10: Female: 10	Male: 10: Female: 1	Male: 8: Female: 8
No of classrooms used	Male: 2: Female: 1	Male: 2: Female: 1	Male: 2: Female: 1	Male: 1: Female: 1	Male: 1: Female: 1
Faculty:	M-Section: 4 F-Section 3:	M-Section: 4 F-Section 3:	M-Section 2: F-Section 3:	M-Section 1: F-Section 4:	M-Section 3: F-Section 4:

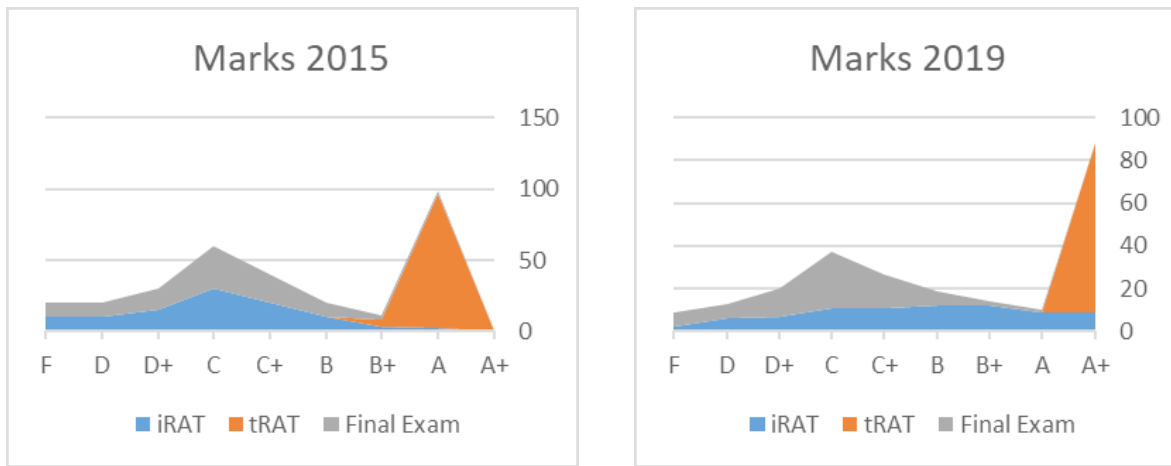
**Table 1 (b): Learning Materials, iRAT and tRAT tests**

Component/Year	2015	2016	2017	2018	2019
Study Material (Langman's Text book of Medical Embryology, Sadler, T.W.,)	9th Edition	9th Edition	12th Edition	12th Edition	13th Edition
No of questions in iRAT/tRAT	5	5	5	5	5
Time to answer iRAT	5min	5min	5min	5min	5min
Time to answer tRAT	≥ 5min	≥ 5min	≥ 5min	≥ 5min	≥ 5min
Using Paper/E-Moodle test for RATs	Paper	Paper	Paper	Paper	iRAT: Paper tRAT: Electronic (Moodle)

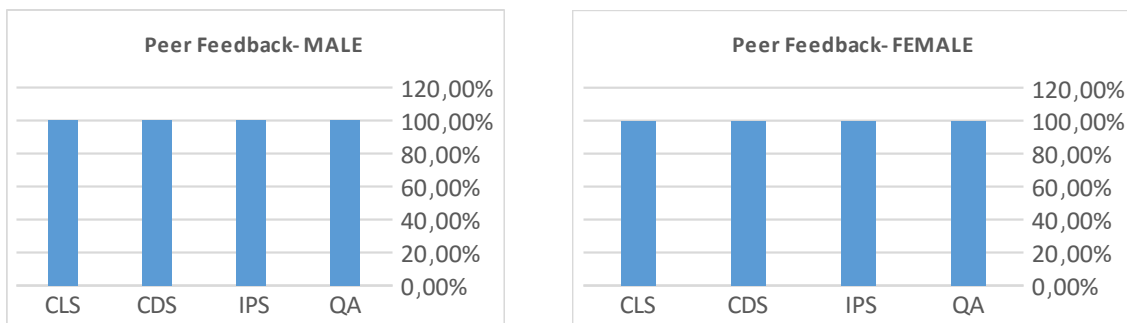
**Marks:** The marks of tRAT in TBL were high when compared to iRAT and the final exam in General embryology, as shown in the graph (1) below.

**Student Feedback Survey:** These were analyzed in two parts: (1) Peer feedback of students on each

other, which was taken during TBL sessions (graph 2). (2) Student Satisfaction Survey, which was taken later after the issue of the final results and includes points of satisfaction of students about TBL, the staff, and the marks. Both surveys seek the student feedback plotted on the Likert scale from 1-5. (Graph 3).

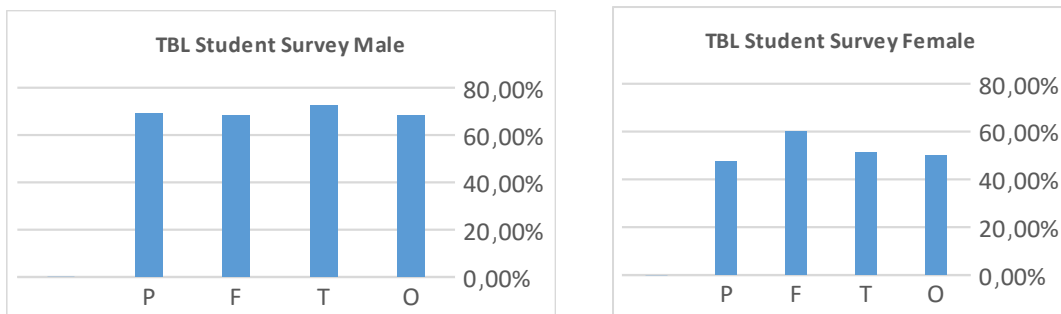


**Graph No. (1): Comparison between marks in the two extreme years of this study (2015- 2019)**



CLS: Cooperative Learning Skills, CDS: Self-Directed Learning, IPS: Interpersonal Skills, QA: Qualitative Assessment.

**Graphs No. (2): TBL Peer Feedback, male and female students.**



P: Process, F: Faculty, T: Team, O: Outcome.

**Graph No. (3): TBL Student Survey, male and female students.**

### Discussion

Team-Based Learning has been gaining traction in academic institutions, especially in the field of medicine. Out of all 144 medical schools in the US, at least 83% use TBL pedagogy. 44 of those institutions also have faculty or staff who are part of the Team-Based Learning Collaborative (TBLC), an international collaborative that focuses on connecting TBL practitioners, sharing

TBL resources, and promoting best practices. Within the top 50 medical schools in the US, 92% use TBL pedagogy. Team-based learning (TBL), when properly implemented, includes many, if not all, of the common elements of evidence-based best practices.<sup>8</sup>

The implementation of TBL in the Embryology module at the Faculty of Medicine, Jazan University, KSA was mentioned before in two posters, but none of

them conduct a thorough analysis and they didn't answer the question whether TBL was applied properly or reach the intended learning outcomes. Besides, the previous two posters were written by an internal reviewer from the Department of Anatomy, and this study was written in collaboration with an external reviewer from the Department of Physiology.

**The Implementation Process of TBL:** TBL in FMJU consists of five essential steps: (1) Individual pre-class learning of a defined topic, triggered by a scenario of a problem, and guided study material was specified from a textbook of GE (2) Individual Readiness Assurance Test (IRAT) in which a student answers a set of MCQ questions individually (3) Team Readiness Assurance Test (TRAT), in which, after answering the IRAT, the students form teams and answer the same test within the team (4) Clarification session, in which instructors facilitate a discussion or debate among teams to consider the possible solutions to the application problem and reach final correct answers to the MCQ of IRAT- TRAT2 and (5) Peer feedback, in which students give feedback to which degree a member of their group is collaborative. These steps were the model of TBL adopted in other universities<sup>3</sup>, only some universities use scratch cards for tRATS. Two sessions were conducted each year, one hour for each session. The time of a session may extend for more than two hours, spent partly in the redistribution of the groups of students, but most often because the students enjoyed the debates on explanation when they select more than one answer to a question. This brainstorming is a high positive outcome of TBL.

**The Facility & the Faculty:** The Male and Female Sections in the FMJU in the first 3 years of the study (2015-17) were placed side by side in one large campus, separated only by prohibited-to mix walls. In the last 2 years (2018-19) the Male Section was relocated to a new campus at the other end of the City of Jazan. This arranged at the beginning-end time of the sessions only through telephones. The faculty shared in the preparation and running of TBL were multidisciplinary from Departments of Anatomy, Physiology, Pathology, Obstetrics, and Gynecology. This gave a sense of integration with other disciplines, especially the Gynecology<sup>1</sup> staff, who provided the students with a valuable clinical application on the cases. In the last year in TBL, a single professor was able to direct the male class all alone, without losing "the effectiveness of small-groups working independently in classes with

high student-faculty ratio<sup>4</sup> - (115:1)".

**The Students:** The number of students shows variation from year to year, but in all years the attendance to TBL sessions was high compared to lectures. The male and female students were planned to start the sessions at the same time normally at 1 pm to avoid the transfer of the iRAT questions. Although they are far apart and not allowed to mix, male and female students have continuous secret phone-connections.

**Study materials and the Readiness tests:** The chapters of General Embryology included in the TBL were not taught in lectures and were completely self-learning. The Readiness Assessment Tests RATs were the 5 best answer questions of higher-order classification. The textbook used for study material was Langman's Medical Embryology, Sadler, T.W, and 9th Edition. Williams and Wilkins Co., Baltimore. The editions were updated up to the 13th edition. Each session was formed of a set of 5 MCQs which students first had to answer individually (iRAT), then in groups (tRAT). Modification of using papers to print the tests took place from year to year. At first expensive colored answer sheets marked by the machine were used. Then on the demand of the administration, a table was plotted in the question papers for the answers. This year E-learning Moodle Program was used for tRAT which enabled students to use tabs and mobile devices to answer. These were improvements in the cost-effectiveness with harm to the core process of TBL.

**Students achievement of learning outcomes:** The marks of TBL were added to the final marks of General Embryology, and this motivated the students and made them take TBL seriously. Marks of the iRAT were like the marks of a student in other section of the final exam, some students were very high and some students low. Marks of tRAT were the high, most often full mark, as they were the result of the work of many brains together, and this is a great positive outcome which proves that TBL is a "powerful and versatile teaching strategy that enables teachers to take small group learning to a whole new level of effectiveness".<sup>1</sup> When marks of TBL were added to the other marks, they enhance the final grade. In General Embryology, which was a great pleasure to the students.

**Student satisfaction:** In the Peer Feedback, the students seemed to have a high opinion on each other, or they might benefit from this high opinion as Peer

Feedback has a mark in the final grade. The student satisfaction about the TBL as a whole is important in the maintenance of TBL and for putting action plans for improvement, and of course research studies about TBL in FMJU.

### Conclusion

Implementation of TBL in the course of General Embryology was analyzed in two points: the process of implementation and the outcome. We concluded that the TBL implementation in FMJU was successful. This was indicated by many points: it was applied continuously for 5 years and gained acceptance from the students and faculty. Multi-disciplinary teachers were involved. Components of TBL process were almost highly fulfilled including iRAT, tRAT and peer feedback. It was even more improved by electronic tRAT. Students show a high percentage of attendance, were self-dependent in reading the study materials, were cooperative in team learning & assessment, and scored high marks, that is, they were interested and gained valuable experience from TBL, thereby, achieving the assigned learning outcomes of the module. The drawbacks were the class rooms in male section, and the female to male discrepancy in the number and specialty of teachers.

**Conflict of Interest:** Nil

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# Correlation of Serum Electrolytes (Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>++</sup>, Mg<sup>++</sup>) and ECG Changes Before and After Exercise

Nasim Alam<sup>1</sup>, Sonali Saxena<sup>2</sup>, Saurabh Saha<sup>3</sup>, Jalaj Saxena<sup>4</sup>, Dolly Rastogi<sup>5</sup>, Chitra Srivastava<sup>6</sup>

<sup>1</sup>Assistant Professor (Physiology), <sup>2</sup>Associate Professor (Medicine), <sup>3</sup>Associate Professor (Physiology), <sup>4</sup>Professor & Head (Physiology), <sup>5</sup> Professor (Physiology), <sup>6</sup>Associate Professor (Physiology), Department of Physiology, G.S.V.M. Medical College, Kanpur

## Abstract

Exercise is known to cause changes in electrolytes in different compartments of the body and homeostasis keeps in check these changes. This study was planned to access and evaluate changes biochemical parameters like Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>++</sup> and Mg<sup>++</sup> along with changes in E.C.G. in healthy young Indian adults. Fifty two healthy students (26 each, male and female) with an age range of 18–30 years were subjects in this study. The participants performed an exercise test of moderate to vigorous intensity on bicycle ergometer. Pre and post exercise biochemical parameters (serum electrolytes Na<sup>+</sup> K<sup>+</sup> Mg<sup>++</sup> Ca<sup>++</sup>) along with ECG was done. The serum sodium levels in both pre & post exercise group were within normal range but serum sodium is highly significant in post exercise group. The serum potassium levels in both pre & post exercise group were within normal range but serum potassium is highly significant in post exercise group. The serum magnesium levels in both pre & post exercise group were within normal range but serum magnesium is highly significant in post exercise group. The serum calcium levels in both pre & post exercise group were within normal range but serum calcium is highly significant in post exercise group. In the ECG the voltage of p wave QRS complex and ST segment shows highly significant/significant changes in pre and post exercise group. The duration of ST segment, RR interval, QT interval and QTc interval change highly significantly in the pre and post exercising group. PR interval is no change in either group.

**Keywords:** Exercise, Serum electrolytes Na<sup>+</sup> K<sup>+</sup> Mg<sup>++</sup> Ca<sup>++</sup>, E.C.G.

## Introduction

Apart from the role of regular exercise in disease prevention there may be sometimes Sports paradox where exercise can also trigger sudden cardiac death particularly in case of underlying cardiac disease. This warranting an adequate cardiac screening (E.C.G.) and individual specific recommendation for sports participation and use of biochemical parameters like Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>++</sup>, Mg<sup>++</sup> can be done to predict metabolic elimination as besides homeostasis alterations.

Similarly electrolytes which make a very important composition of body homeostasis system (buffer). Magnesium is vital for muscle electrolyte homeostasis, oxygen uptake and energy production.

Sodium has been falsely blamed for hypertension when the true cause is the chlorine component of sodium chloride. Excessive consumption of sodium is associated with increased risk of gastric ulcers. Increasing sodium consumption by 1 gram per day cause 500 mg calcium taken from bone can attribute to bone loss of 1 percent per annum unless calcium loss is compensated for by supplementation or increased dietary calcium intake Shorttet al 1990<sup>[1]</sup>.

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### Corresponding Author:

**Dr. Saurabh Saha**

Associate Professor, Department of Physiology,  
G.S.V.M. Medical College, Kanpur  
e-mail: drsahagsvm@gmail.com

Physical exercise had been shown to induce bone mass gain, especially in load bearing bone sites Maimoumet al 2005<sup>[2]</sup>. Parathyroid hormone (PTH) which is the major regulator of bone metabolism,

functions to maintain the calcium ion concentration of the extra cellular fluids within physiological limit. The activity of PTH and readily influenced by both exercise duration and intensity. Renal reabsorption of calcium or a combination of the two are factor that lead to increase in urinary excretion of calcium but serum levels of calcium are under strict homeostatic control and remain within narrow limits .

Potassium the main electrolytes found inside the body's intracellular fluid and stored in muscle fibres along with glycogen plays a key role by helping transport glucose into the muscle cells, interacts with both sodium and chloride to control fluid and electrolyte balances and assists in the conduction of nerve impulse Armstrong and Epstein 1999 [3].

Gerth J et al 2002[4] studied that the serum concentrations of potassium, protein and albumin after strenuous exercise decreased significantly but remained within physiological ranges. The serum sodium concentration decreased immediately after the race.

Meludu, Yoshitake et al (2002) [5] Studied the homeostasis of each of minerals on sedentary and exercise days. Subjects were restricted within the premises of the research institute and relaxed as much as possible. Apart from the 3-minute anaerobic exercise on exercise day, the activities of the subjects were not different from that on sedentary day.

Exercise induced a significant increase in urinary excretion of Zn and Mg, a decrease of K and no significant effect on urinary excretion Ca. Interestingly, the excretion of the minerals normalized except Mg, which remained high 12 hours after exercise. On a 24 hr bases, Mg and Zn excretion were increased, while Ca and K did not change significantly on exercised day compared with sedentary day.

John Onimisi Ogedengbe et al 2012 [6] in their study, QTC durations fell within the normal range, higher in the females both pre and post-exercise. An increase was recorded post-exercise in both sexes the increase in males was statistically significant (p-value <0.05).

Exercise-induced gastrointestinal symptoms are caused by shifts in blood flow and electrolyte balances in response to changing metabolic demands. During physical activity, body magnesium stores shift transiently from the plasma into skeletal muscle and adipose tissue to increase energy production and counteract oxidative

stress Nielsen and Lukaski 2006[7].

## Materials and Method

This cross sectional study would include 52 students both male and female of 18 to 30 years old enrolled in 1<sup>st</sup> year MBBS in GSVM Medical College Kanpur, Informed consent was taken from each subject. The study group consisted of young healthy individuals (males and females).who were selected randomly from the whole MBBS 1<sup>st</sup> year batch.

Pre and post exercise biochemical parameters (serum electrolytes Na<sup>+</sup> K<sup>+</sup> Mg<sup>++</sup> Ca<sup>++</sup>) along with ECG was done.

Detailed information was collected through careful history and physical examination.

After measurements the subjects were instructed to warm-up on the cycle ergometer for 5 minutes at a very light workload. At this time, the seat height was adjusted to the optimal height and comfort. The light warm up was followed up by 5 minutes of stretching, primarily emphasizing the torso and the lower extremities. The workload increased at the end of the 3 minute intervals (stages) until volitional fatigue. The target of the exercise was to achieve a heart rate 125-130 beats/minute (severe exercise) and it was achieved in 10 to 15 minutes by doing the cycling without any extra load. The brink of exhaustion after 10 minutes of exercise was taken as end point of the exercise for that subject. 5ml of blood sample was drawn from antecubital vein of each subject before and after exercise, Simultaneously ECG was done, Serum was subjected to biochemical assay for estimation of serum electrolytes (Sodium, Potassium Magnesium, calcium). All these biochemical estimation would be done in department of pathology GSVM Medical College Kanpur.

The Electrocardiogram (ECG) records the changes in magnitude and direction of the electrical activity of the heart. The electrodes placed in standard positions on the body detect the electric current generated by depolarisation and repolarisation of the atria and ventricles. The voltages generated are amplified and recorded on ECG paper as waves and complexes. Statistical analysis of groups was compared by independent Student's t test. A two-tailed ( $\alpha=2$ ) p value less than 0.05 (p<0.05) was considered statistically significant. Analyses were performed on SPSS software (windows version 17.0).

### Observations and Results

A total of 61.53% participants perform physical exercise as a routine. In which 34.61% were male participants and 26.92% were female.

**Table 1: Various Parameters in Pre and Post Exercise Group**

Exercise group		Mean±SD	p-Value
Sodium	Pre	141±3.10	<0.001
	Post	142±3.51	
Potassium	Pre	4.1±0.32	<0.001
	Post	4.15±0.29	
Magnesium	Pre	1.84±0.09	<0.001
	Post	1.87±0.10	
Calcium	Pre	4.58±0.23	<0.001
	Post	4.60±0.24	

A highly significant (p<0.001) difference was observed between pre and post exercise level of serum sodium, serum potassium, serum magnesium, serum calcium.

**Table 2: Various Parameters in Pre and Post Exercise Group**

Parameters			Mean±SD	p-Value
Heart Rate (beat per minute)	Pre	80.10±10.80	<0.001	
	Post	104.10±12.54		
P wave	Voltage (mv)	Pre	0.14±0.04	<0.001
		Post	0.16±0.04	
	Duration (ms)	Pre	0.08±0.02	>0.05
		Post	0.11±0.13	
PR interval	Duration (ms)	Pre	0.14±0.02	NC
		Post	0.14±0.01	
QRS (complex)	Voltage (mv)	Pre	1.09±0.29	<0.05
		Post	1.14±0.32	
	Duration (ms)	Pre	0.10±0.13	>0.05
		Post	0.073±0.01	
ST segment	Voltage (mv)	Pre	0.01±0.04	<0.001
		Post	0.04±0.04	
	Duration (ms)	Pre	0.09±0.02	<0.001
		Post	0.09±0.02	
RR Interval	Duration (ms)	Pre	0.14±0.02	<0.001
		Post	0.10±0.07	
QR Interval	Duration (ms)	Pre	0.35±0.01	<0.001
		Post	0.32±0.01	
QTc Interval	Duration (ms)	Pre	0.41±0.01	<0.001
		Post	0.42±0.01	

The study which was conducted by us consisted of participants in the age group of 17-30 years of which maximum no of participants were the age group of less than 20 years where 28 male and 24 are females. The study is primarily enrolled young adults.

As per their habits majority of the participants (73.07%) were non vegetarian. The ratio of non vegetarians to vegetarians was 3:1 and dietary habits of both genders were in the ratio of 1:1. On distributing the participants on the basis of those involved in physical exercise, total of 61.53% performed physical exercise as a routine daily in which 36.61% were male and 26.92% were female.

Approximately 73.03% of participants who are having B.M.I. (Body Mass Index) in the optimal range while 9.6% were below and about 17.30% participants were having above normal value of B.M.I.

In our study highly significant (p<0.001) difference was observed between pre and post exercise levels of serum sodium, serum potassium, serum magnesium, serum calcium.

Evans J 1951<sup>[8]</sup> found in his study that p wave becomes taller after exercise this results is more significant in lead II and III the same result is observed in our study.

Holzman D et al 1952<sup>[9]</sup> studied about PR interval and said usually unaltered after exercise or slightly shortening of of PR intervals occurs which is supported our study also. The same author observed slight prolongation of the interval may occur where beginning of the p wave is indistinct at the rest.

The QTc interval in our study increases in both sexes which is similar to John Onimisi Ogedeube et al 2012 <sup>[6]</sup> where the QTc duration was higher in female than males.

Effects of exercise on PR intervals, QRS durations and QTC intervals in male and female students of University of Abuja John Onimisi Ogedengbe et al 2012<sup>[6]</sup> studied that QTc durations fell within the normal range, higher in the females both pre and post-exercise. An increase was recorded post-exercise in both sexes the increase in males was statistically significant (p-value <0.05). This result also supported our study.

Ted D. Adams et al <sup>[10]</sup> 2007 electrographic changes in athletes have been well described. Common findings

include sinus bradycardia, atrioventricular conduction disturbances, ST-T-wave changes, and voltage changes of ventricular hypertrophy. These ECG changes are believed to be the result of physiologic changes of the cardiovascular system caused by prolonged physical activity. Fewer studies that describe the serial changes in normal individuals undergoing exercise training have been reported.

Rautaharajuet et al 1999<sup>[11]</sup> found change in both magnitude and duration of P wave along with ST segment during submaximal exercise. The results of this study also correspond with our observations.

The biochemistry of runners in 1600 km ultra marathon study done by Fallon KE et al 1999<sup>[12]</sup> suggests prolonged exercise and increase in serum calcium. In our study highly significant increase in calcium and sodium levels are seen.

Nielson and Lukaski 2006<sup>[7]</sup> update on relationship between magnesium and exercise states that during physical activity body magnesium stores shift transiently from the plasma into skeletal muscle and adipose tissue to increase energy production and adipose tissue to increase energy production and counteract oxidative stress. In our study significant changes in serum magnesium are seen.

Koc et al 2010<sup>[13]</sup> determined in their study they conducted in order to make a comparison between blood electrolyte levels of athletes and sedentary university students that sodium and potassium levels were higher in athletes and this difference was significant, which does support our finding.

### Conclusion

The serum sodium levels in both pre & post exercise group were within normal range but serum sodium is highly significant in post exercise group. The serum potassium levels in both pre & post exercise group were within normal range but serum potassium is highly significant in post exercise group. The serum magnesium levels in both pre & post exercise group were within normal range but serum magnesium is highly significant in post exercise group. The serum calcium levels in both pre & post exercise group were within normal range but serum calcium is highly significant in post exercise group. In the ECG the voltage of p wave QRS complex and ST segment shows highly significant/significant changes in pre and post exercise group. The duration of ST segment, RR interval, QT interval and QTc interval

change highly significantly in the pre and post exercising group. PR interval is no change in either group.

Thus the findings of our study as above would be highly helpful in evaluating & estimating the serum electrolyte level the biochemical parameter and ECG changes in exercising young adults, but further study are still needed.

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** Given by Institutional Ethics Committee of the college.

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