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Original Research Article

A Study to Compare the Effects of Perceived Stress on Waist Hip Ratio and Cardiovascular Profile of MBBS and Paramedical Students in a Medical College of West Bengal

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ABSTRACT

Background: Medical education is inherently stressful and health care professionals also experience excess stress as has been observed in different studies. Aims: To compare the effects of perceived stress on waist hip ratio and cardiovascular profile of MBBS and Paramedical Students in a Medical College of West Bengal.

Materials and methods: This pilot project was conducted in Burdwan Medical College among MBBS and paramedical students after taking institutional ethical clearance and informed consent of the subjects. 100 MBBS students were considered as study group (Group I) and 100 paramedical students as control (Group II). The subjects were age, sex and dietary habit matched. Perceived stress scores were assessed. Anthropometric assessments were done, lipid profile, fasting sugar were analyzed. Resting pulse rate and blood pressure were measured and 40 mm Hg endurance test, Isometric hand grip test was done for cardiovascular assessment.

Results: GI had significantly higher PSS as compared to GII. PSS GI: 27.98 $\pm$ 3.09 vs. GII 19.03 $\pm$ 3.4; P value < 0.0001. There was no significant difference in BMI between the two groups. Waist Hip ratio was significantly higher in Group I as compared to Group II. Group I had significantly higher Pulse rate, Systolic and Diastolic Blood Pressure as compared to Group II. In Group I: 40 mm endurance time was 25.09 ± 3.1 while in Group II: 29.83 ± 1.7. The difference in means was highly significant with p value of < 0.0001. IHG: Group II 12.99 ± 3.05 and Group I 16.44 ± 1.99; P value of < 0.0001. MBBS students had significantly higher levels of total cholesterol, triglyceride and VLDL cholesterol levels as compared to paramedical counterparts. But there was no difference in fasting sugar and LDL between the two groups. Paramedical students had significant higher levels of HDL cholesterol as compared to MBBS students.

Conclusions: Medical students perceive more stress as compared to their paramedical counterparts and high perceive stress level may have a negative impact on cardiovascular profile and quality of life.

Keywords: Perceived stress, Medical Education, Cardiovascular Profile.

INTRODUCTION

Stress is a complex body response with emotional, cognitive, and biological factors. Excessive stress may lead to long- and short-term disability in various human systems and cause activation of different defense mechanisms of the central nervous system. The stress responses differ according to the type of stress and the individual's physiological responses. These responses consist of neuro-endocrine and behavioral responses, as well as the changes in the activity of the hypothalamo-pituitary-adrenal (HPA) axis and immune function. [1-3]

Glucocorticoids, the hormonal end-product of the HPA axis, exert primarily catabolic effects to utilize every available energy resource against the challenge posed by intrinsic or extrinsic stressors.

Glucocorticoids increase hepatic gluconeogenesis and plasma glucose concentration, induce lipolysis (although they favor abdominal and dorsocervical fat accumulation) and cause protein degradation at multiple tissues to provide amino acids that would be used as an additional substrate for oxidative pathways. In addition to their direct catabolic actions, glucocorticoids also antagonize the beneficial anabolic actions of GH, insulin and sex steroids on their target tissues. [4-6]

Chronic activation of HPA axis, however, would be damaging as it is expected to increase visceral adiposity, decrease lean body (muscle and bone) mass, suppress osteoblastic activity and cause insulin resistance. The integrity of metabolic homeostasis is also centrally affected by the neuroendocrine integration of the HPA axis and the central stress pathways to the CNS centers that control appetite/satiety and energy expenditure. [7] Previous studies have shown that perceived stress negatively affects cardiovascular functions by altering cardiovascular reactivity and increasing blood pressure. The autonomic dysfunction induced by chronic stress can explain at least in part the cause of this association. [8-10]

Epidemiological studies have found adverse psychological states like depression, anxiety, social difficulties such as unemployment and divorce are related to central body fat distribution. Stress causes increased cortisol secretion and increased sympathetic activity. However, it remains less clear whether there is any relation between stress induced cortisol secretion, change in autonomic activity and fat distribution among healthy non-depressed people. [11-16]

Medical education is inherently stressful; health care professionals also experience excess stress as has been observed in different studies. High occupational stress along with burnout among physicians can lead to sleep problems, anxiety, depression, and even suicide. Stressful life events are closely related to the onset of chronic insomnia and are mediated by certain predisposing personality factors. But, the actual risk for these behavioral health problems in physicians has been seldom being explored in Eastern India. The present study was conducted to compare the effects of perceived stress on waist hip ratio and cardiovascular profile of healthy young MBBS students as well as paramedical students to assess the present impact of stress on medical profession even in the early stages of Medical career.

MATERIALS AND METHODS

This cross- sectional observational study was conducted in a time span of six months in Burdwan Medical College. The study was conducted in the Department of Physiology after taking Institutional ethical clearance and informed consent of the subjects. **Inclusion criteria:** Hundred first MBBS students studying in Burdwan Medical College were chosen as study group (GI) and hundred paramedical students as control (GII).

The subjects were allocated to the two groups using an online randomizer. Convenient sampling method was used.

Exclusion Criteria: Any illness, acute or chronic, affecting cardiorespiratory efficiency; any type of acute illness e.g. fever, cough, breathlessness, trauma etc.; individuals taking any type of medication; past history of prolonged medication or prolonged hospitalization, major surgery, any chronic illness of cardiovascular system, respiratory system, neuromuscular or any other systemic illness was enquired about, and subjects who indicated a disease state were excluded from the study. Alcohol, drug, tobacco addicts and smokers were excluded. Any subject undertaking any yoga or meditation practices, or engaged in sports activity was excluded. Subjects taking any drug that may alter autonomic reflexes and lipid metabolism were not included.

The purpose, relevant methodology and general details of the study were

explained to the subjects. Clinical history was recorded followed by anthropometry and clinical examination. Subjects falling in the preset exclusion criteria were excluded. Both the groups were age, sex matched and their food habits were comparable.

Fasting blood samples were drawn from subjects by sterile needle and syringes and sent to biochemical laboratory in sterile vials for analysis of Lipid profile and fasting sugar.

Participant fasting requirements

To obtain accurate results, participants must fast for 12 hours before blood collection. The participants were asked not to eat or drink anything (except plain water) after dinner at 8pm the night before and blood samples were collected during the next morning hours as per convenience of the participant.

Sample processing and analysis

After plasma separation by centrifuge, quantitative estimation of glucose, Cholesterol, HDL and triglyceride was conducted by standardized enzymatic colorimetric method. The fasting blood sugar was analyzed by glucose oxidase peroxidase (GOD/POD) method; triglycerides by glycerol phosphate oxidase / Peroxidase (GPO-PAP) method and HDL-Cholesterol by phosphotungstic acid method, Total Cholesterol estimated by CHOD - PAP method

All analysis was done using automated clinical chemistry analyzer (TRANSASIA ERBA XL- 600) and calculation at the Biochemistry Laboratory of Burdwan Medical College. For all biochemical analysis, coefficient of variation was < 10.

Pre-test instructions were given to avoid consumption of any drugs that may alter the Cardio respiratory parameters 48 hours prior to the test. The subjects were advised for a good restful sleep. On the day of the test, no cigarette, nicotine, coffee, or drugs were permitted. Perceived stress of the subjects was measured by Shelden Cohen's Perceived stress scale. [17]

Anthropometric measurements were done; Resting pulse rate and blood pressure were recorded; followed by Isometric hand grip test, 40mm endurance test.

Anthropometry: Weight and height were measured, BMI were calculated and waist/hip ratios were measured.

Body Mass Index (BMI)

BMI was calculated as body weight in kilograms divided by square of body height in meters. **Waist - Hip Ratio (WHR)**

WHR of the subjects were measured. Waist circumference was measured at the level of umbilicus and hip circumference at the fullest point around buttocks. Waist circumference was divided by hip circumference in order to calculate the WHR.

All the subjects were then administered Perceived Stress Scale. PSS is the most widely used psychological instrument for measuring the perception of stress. The questions in the PSS are of general nature, relatively free of content specific to any sub-population group and enquire about feelings and thoughts to measure the "degree to which situations in one's life is appraised as stressful" especially, over last 1 month. The items are easy to understand and response alternatives are simple to grasp. Items are designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. It comprises of 10 items, four of which are reverse-scored, measured on a 5-point scale from 0 to 4. PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 and 4 = 0) to the four positively stated items (items 4, 5, 7, and 8) and then summing across all scale items. [17]

Cardiovascular parameters:

The subjects were made to rest for 15 minutes in supine position. The resting time given to subjects in between two tests was 5 to 10 minutes.

Resting pulse rate

Pulse rate determines cardiac work load as it is one of the determinants of cardiac output. Pulse rate is the marker of both

parasympathetic and sympathetic activity because of dual innervations of the heart. After a complete rest of 15 minutes' pulse rate was measured by palpatory method for a complete one minute.

Blood Pressure:

Equipment: Mercury sphygmomanometer with appropriate sized cuff and stethoscope.

Procedure: BP was measured according to the recommendations of the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7) and WHO-STEPS.

Blood pressure response to sustained isometric handgrip (IHG): Basal blood pressure was measured. Then the subject was asked to perform maximum grip of the handgrip dynamometer in sitting position with his dominant hand and the maximum capacity was noted down. After 5 minutes, the subject was asked to hold his grip with 30% of the maximum capacity for 5 minutes and the blood pressure was recorded just after release of the grip. The rise in diastolic blood pressure was calculated and taken as the result of IHG test.

40 mm Hg endurance test: The procedure was conducted by asking the subjects to take in a full breath and blow against the mercury column of sphygmomanometer up to pressure of 40 mm, maintaining it as long as possible. The time (in seconds) for which the student could maintain the mercury level at 40mm Hg was noted. The lips were secured tightly around the Mouth piece with the help of fingers to ensure that there was no leak. Nostrils were closed with the help of nose clips. Care was taken to see that the subjects did not use oral muscles or tongue to develop pressure or to block tubing. The maximum time the subjects can hold the mercury up to 40 mm was noted and taken as result.

Statistical analysis: The computer software "Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc. Released 2007. SPSS for Windows, Version 16.0. Chicago, SPSS Inc.) was used to analyse the data. The difference between the groups was considered significant and highly significant if the analysed probability values (*P* value) were *P* <0.05* and *P* <0.01** respectively.

RESULTS

This pilot project was conducted in Burdwan Medical College among MBBS and paramedical students. 100 MBBS students were considered as study group (Group I) and 100 paramedical students as control (Group II). The subjects were age, sex and dietary habit matched. Perceived stress scores were assessed. GI had significantly higher PSS as compared to GII. PSS GI: 27.98 ± 3.09 vs. GII 19.03 ± 3.4; P value < 0.0001 (Table 1; Figure 1). There was no significant difference in BMI between the two groups. Waist Hip ratio was significantly higher in Group I as compared to Group II (Table 1; Figure 2).

TABLE 1: COMPARISON OF BASIC DESCRIPTIVE STATISTICS

Parameter	GI (N=100) Mean ± SD	GII (N=100) Mean ± SD	P value
Age (years)	18.92 ± 0.9	18.89± 1.02	0.263
PSS	27.98 ± 3.09	19.03 ± 3.4	<0.0001**
BMI (kg/m^2)	25.06 ± 2.75	24.33 ± 2.56	0.058
Waist/Hip	0.97 ± 0.02	0.87 ± 0.05	<0.0001**
Pulse (per min)	85.6 ± 8.43	69.19 ± 5.19	<0.0001**
Systolic BP (mmHg)	134.84 ± 0.98	107.47 ± 4.32	<0.0001**
Diastolic BP (mmHg)	89.51 ± 1.83	80.12± 4.057	<0.0001**
IHG	16.5 ±2.1	12.9 ± 3.1	<0.0001**
40mm Endurance Test	25.09 ± 3.1	29.83 ± 1.7	<0.0001**

P value ** highly significant

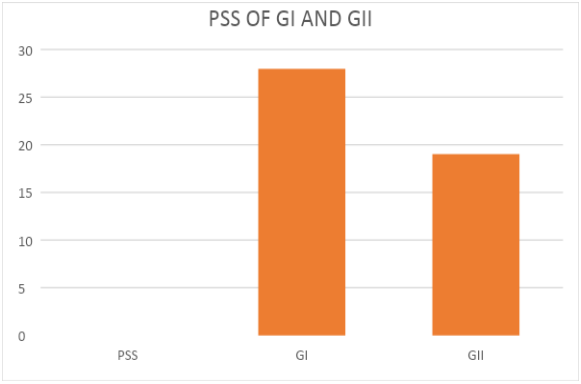

FIGURE 1: PSS OF BOTH GROUPS

Group I had significantly higher Pulse rate, Systolic and Diastolic Blood Pressure as compared to Group II. In Group I: 40 mm endurance time was 25.09 ± 3.1 while in Group II: 29.83±1.7. The difference in

means was highly significant with p value of < 0.0001 (Table 1). IHG: Group II 12.99 ± 3.05 and Group I 16.44 ± 1.99; P value of <0.0001 (Table 1). MBBS students had significantly higher levels of total cholesterol, triglyceride and VLDL cholesterol levels as compared to paramedical counterparts. But there was no difference in fasting sugar and LDL between the two groups. Paramedical students had significant higher levels of HDL cholesterol as compared to MBBS students (Table2).

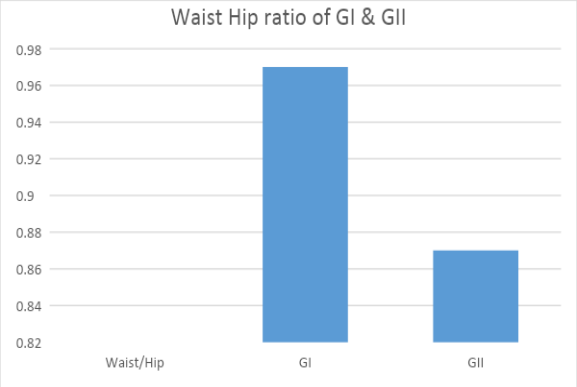

FIGURE 2: WAIST HIP RATIO OF BOTH GROUPS

TABLE 2: COMPARISON OF LIPID PROFILE AND FASTING SUGAR

Parameter	GI (N=100) Mean ± SD	GII (N=100) Mean ± SD	P value
FBS (mg/dl)	86.02±11.07	85.40±11.73	0.69
TOTAL CHOLESTEROL (mg/dl)	163.38±12.57	156.49±11.51	<0.0001**
TRIGLYCERIDE (mg/dl)	136.02±24.69	128.79±21.99	<0.03*
LDL(mg/dl)	92.9±18.48	93.87±14.27	0.68
HDL(mg/dl)	40.56±5.52	55.02±4.377	<0.0001**
VLDL(mg/dl)	33.03 ± 1.39	23.62 ± 4.08	<0.0001**

P value * significant
P value ** highly significant

DISCUSSION

Perceived stress scores were significantly higher in MBBS students in the present study as compared to paramedical controls. Cardiovascular parameters studied were negatively affected by perceived stress. Waist Hip ratio, Total cholesterol, triglyceride and VLDL cholesterol levels also increased with increase in PSS. All these findings may result in increased incidences of cardiovascular disease and metabolic syndrome in future.

Perceived stress has been reported higher among health professionals. A national survey of physicians in Canada showed that both male and female doctors experienced high levels of occupational stress. A study in a teaching hospital in Pakistan showed that 68% of the doctors were overloaded with their jobs. In previous studies female doctors have been found to have significantly lower satisfaction with their workload. American Foundation for Suicide Prevention reported that, death by suicide is about 70% more likely among male doctors than among other professionals and 250-400% higher among female doctors. [18]

High occupational stress along with burnout among physicians can lead to sleep problems, anxiety, depression, and even suicide. But, the actual risk for these behavioral health problems in physicians has been seldom being explored in Eastern India. So the present study was conducted to assess the effect of perceived stress on physicians in their early school days.

We had conducted pilot projects to study the effects of stress on Medical students and effect of Progressive muscle relaxation. Progressive muscle relaxation helps in modulation of heart rate, blood pressure, and lipid profile in healthy normal adult individuals. Increased stress levels do increase body mass index and waist/hip ratio, dyslipidemia. This perhaps leads to autonomic dysfunctions and increase in incidence of cardiovascular disease. Subjects with blood group O perceive more stress as compared to subjects of blood group A and perceived stress causes dyslipidemia. PMR and walking were equally effective in reducing stress and improving cardiovascular profile in young adults and may be used as a cost-effective way to improve health and quality of life. Lifestyle modification with relaxation exercises does affect stress levels to decrease and improves autonomic functions, cardiopulmonary efficiency, and lipid profile. [19-21] In the present study we compared Perceived stress levels of MBBS

students with paramedical counterparts and observed the effects on cardiovascular profile and lipid metabolism.

The present learning experience at in MBBS curriculum in West Bengal involves didactic lecture-based formats, which are often supplemented with short, intensive, summary tutorials. This may result in a teaching learning gap in medical education. This further increases stress levels of MBBS students. [22]

Many studies have shown that stress levels of medical students are genuinely high. Academic reasons and emotional factors are greater during the first year while reasons related to patient care and physical factors are more important in subsequent years. Long working hours, lack of peer support, competitive environment, rigid authoritative non-encouraging faculty, an imbalance between professional and personal lives, lack of recreational activities, staying away from home, financial problems, residency queries, an uncertain future, emergency situations, speedy decisions, life and death issues, cultural and minority issues, mismatch between capability and expectation are some reasons of stress. [23] So the present study was conducted on first MBBS students.

Nearly over a decade, medical education has been on the lookout for transformation. The current healthcare environment requires competent physicians to coordinate with an interprofessional team to deliver safer, quality, and more cost-effective patient care. These factors are responsible for the growing trend in medical education reforms. [24-27]

The Medical Council of India in 2019 has implemented learner-centered models as well as competency-based curriculum. Competency based Medical Education provides an effective outcome-based strategy where various domains of teaching including teaching learning methods and assessment form the framework of competencies. The Medical Council of India has laid the basic framework for the revised undergraduate medical curriculum. In the new curriculum stress management programmes have been included in the foundation course of MBBS students. [28] AETCOM (attitude, ethics, communication) has also been included in the teaching module. Different measures have been improvised to decrease the teaching learning gap. These measures may help to decrease stress levels among medical professionals and ultimately improve patient care in the long run.

CONCLUSIONS

Medical students perceive more stress as compared to their paramedical counterparts and high perceive stress level may have a negative impact on cardiovascular profile and quality of life. Implementation of stress management programmes in medical schools in early years may help to reduce stress induced morbidity and mortality among medical professionals and ultimately benefit patient care in future.

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