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RESEARCH ARTICLE

Assessment of level of stress and its correlation with blood pressure in medical students

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ABSTRACT

Background: Hypertension is a global problem which can lead to cardiovascular and cerebrovascular complications. Medical education can impose significant psychological stress on undergraduates. Considerable degree of psychological morbidity has been reported among medical students ranging from stress, interpersonal problems and suicidal ideation to psychiatric disorders and they tend to have greater psychological distress than general population. Stress is one of the factors known to cause variation in blood pressure (BP). Maintaining normal BP is essential for well-being of an individual. **Aims and Objectives:** To assess the level of stress and to correlate stress level with BP in medical students. **Materials and Methods:** BP was recorded using sphygmomanometer, in the sitting posture after 5 min of rest (n = 92). Three readings were taken, and the average was considered. The medical student stressor questionnaire (MSSQ) is a validated instrument used to identify sources of stress in medical students. The items in MSSQ represent 20 possible sources of stress in medical students identified from the literature grouped into six main domains. Data collected were analyzed using SPSS Version 23. Descriptive statistics of the study participants were done. Pearson correlation was done to find the correlation between stress domains and BP levels. **Results:** Medical students have mild to moderate degree of stress. There was a statistically significant correlation between diastolic BP (DBP), academic-related stressors (ARS), and group activities related stressor (GARS) ($P < 0.05$). **Conclusions:** Among the six domains of MSSQ, ARS and GARS have shown significant correlation with DBP. Hence, proactive measures have to be taken to address the issue of stress in medical students and to prevent the progression of elevated BP to hypertensive levels, to prevent complications related to hypertension for well-being of the students.

KEY WORDS: Medical Student Stressor Questionnaire; Stress; Blood Pressure; Medical Students

INTRODUCTION

Stress is a term that refers to the sum of physical, mental and emotional strains or tensions on a person. Hans Selye divided stress into eustress and distress.[1] Whenever the stress increases the performance of an individual, it is termed as eustress, and persistent stress which is not resolved leads to distress.[1] Medical education can impose significant psychological stress on undergraduates at time of their life when they are also involved in issues related to lifestyle and careers.[2] Prevalence of stress in medical students worldwide as put forward by a meta-analysis is 28% as compared with age-matched peers and non-medical students probably due to stressors such as academic pressure, workload, financial hardships, and sleep deprivation in medical education.[3] Increased stress and anxiety may lead to poor academic performance, addiction to drugs, affect interpersonal relationships, dropping out of medical course,

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reduced self-esteem, and suicidal tendencies.[3] Excessive unresolved stress may lead to physical and mental health problems in medical students.[3]

Prolonged exposure to psychological stress can lead to blood pressure (BP) derangements and finally to hypertension.[4] Individuals with elevated BP have higher levels of blood glucose and triglycerides, higher body mass index (BMI), lower levels of high-density lipoprotein cholesterol, and insulin resistance than the normotensives.[5] Approximately 29.2% of the world population will be suffering from hypertension by the year 2025.[4,5] Hypertension is an important independent predictor of cardiovascular disease, cerebrovascular accidents, and death.[5] The cardiovascular diseases have led to millions of deaths in the previous decade and are expected to increase in future.[6] There are some studies which have been carried out on stress levels of medical students in foreign countries, but not much information is available in Indian scenario. The present study was taken up as there is a dearth of data regarding stress levels of medical students in India with the objective to assess the level of stress in medical students and to correlate stress levels with BP in medical students.

MATERIALS AND METHODS

A total of 92 subjects who were non-smokers with normal BMI, without any history of drug intake and acute illness were included. Subjects with any disease or condition that affects BP were excluded. The study was approved by the Institutional Ethical Committee. The study protocol was explained to the subjects, written and informed consent was obtained. History was taken from all subjects. Anthropometric measurement (height and weight) was recorded for all subjects. BMI was calculated using Quetelet's index, calculated as weight (kg)/height^2 (m^2). BP was measured using a sphygmomanometer after 10 min rest in sitting posture from the right arm and was recorded to the nearest 2 mm Hg using 1st and 5th Korotkoff sounds. Three BP measurements were recorded, and the mean of the closest two reading was considered for the analysis.

Stress levels were assessed using medical student stressor questionnaire (MSSQ)[7] which is a validated instrument to identify sources of stress in medical students. The items in MSSQ represent 20 possible sources of stress in medical students identified from the literature grouped into six main domains: Academic related stressor (ARS), intrapersonal and interpersonal related stressor (IRS), teaching and learning related stressor (TLRS), social related stressor (SRS), drive and desire related stressor (DRS), and group activities related stressor (GARS).[7] Students were asked to answer all the questions and time limit was not imposed. The questionnaire was answered in the presence of the investigators who cleared the doubts, if any, regarding questionnaire.

RESULTS

Data collected were analyzed using SPSS Version 23. Descriptive statistics of the study participants were done. The study had a total of 92 students. Results showed that students had moderate stress for ARS and mild stress for IRS, TLRS, SRS, and DRS. GARS had stress between mild and moderate levels. Pearson correlation was done to find the correlation between stress domains and BP levels. There was a significant correlation between diastolic BP (DBP), ARS, and GARS ($P < 0.05$) [Tables 1-3].

DISCUSSION

In India, the stress level was found as high as 89.64%.[3] Recently, stress has appeared as an emerging issue among the medical students due to academic, peer, socioeconomic stressors.[3] Studies have shown the prevalence of stress in medical students ranging from 30% to as high as 50%.[8]

In the present study, MSSQ was used as a tool to assess stress levels in medical students and stress levels were correlated with BP. The study subjects showed mild to moderate degree of stress in all the six domains with the highest degree of stress recorded in ARS. Average systolic BP recorded in the subjects was 116.79 ± 10.463 mm of Hg and DBP was 79.76 ± 7.547 mm of Hg. Although there was a positive correlation between stress domains and BP, a statistically significant

Table 1: Descriptive statistics of the study participants

Parameters	Mean±SD
Height (cm)	164.060±8.1601
Weight (kg)	64.72±64.368
BMI (kg/m^2)	21.484457±2.9181702
SBP (mm Hg)	116.79±10.463
DBP (mm Hg)	79.76±7.547

BMI: Body mass index, DBP: Diastolic blood pressure, SBP: Systolic blood pressure, SD: Standard deviation

Table 2: Stress levels in the six domains of MSSQ in medical students

Stress domains	Mean±SD
ARS	1.942500±0.6481328
IRS	1.278696±0.7592423
TLRS	1.218478±0.7107556
SRS	1.328478±0.6502593
DRS	0.8048±0.75028
GARS	1.5602±0.76218

MSSQ: Medical student stressor questionnaire, ARS: Academic-related stressors, IRS: Intrapersonal and interpersonal related stressor, TLRS: Teaching and learning related stressor, SRS: Social related stressor, DRS: Drive and desire related stressor, GARS: Group activities related stressor, SD: Standard deviation

Table 3: Correlation between BP and stress domains in medical students

BP components	Correlation	ARS	IRS	TLRS	SRS	DRS	GARS
SBP	Pearson correlation	0.122 (*r*)	0.022	−0.114	0.005	0.098	0.178
	Significant (2-tailed)	0.246 (*P*)	0.838	0.279	0.961	0.353	0.089
DBP	Pearson correlation	0.223* (*r*)	0.159	0.054	0.080	0.040	0.264*
	Significant (2-tailed)	0.032 (*P*)	0.130	0.609	0.446	0.704	0.011

*Correlation is significant at the 0.05 level (2-tailed). DBP: Diastolic blood pressure, SBP: Systolic blood pressure

positive correlation was found between DBP, ARS, and GARS. From the results, it is evident that the ARS and GARS also lead to increase in DBP.

Similar results were reported by a study that high levels of stress were mainly due to academic-related activities.[8] Earlier studies have also shown that high-stress level in medical students has resulted in poor academic performance, but at the same time, the students who can manage the stress are associated with higher academic performance.[3] Medical students are supposed to learn and acquire a lot of knowledge, skills in short duration of time. They are also expected to develop good interpersonal communication skills to communicate with colleagues, patients and their attendants, apart from academics. The result of the present study showed that the subjects had mild to moderate level of stress whereas other studies have shown academic-related activities caused a high level of stress. This may be due to the difference in personal traits, cultural backgrounds, and coping skills.[8,9] Earlier studies are in agreement with the result of present study that DBP increases with an examination which is one of the parameters for ARS.[10,11] Sustained elevation of BP due to stressors can lead to baroreceptor resetting, and hence, hypertension.[5] Hypertension is an important independent predictor of cardiovascular disease, cerebrovascular accidents, and death.[5] Hypertension leads to increased morbidity and mortality.[5] Hypertension has increased progressively in younger generations in the past 20 years. Studies have suggested that chronic exposure to stress may increase the BP levels.[4] Increase in BP is probably due to increase in sympathetic activity on exposure to stress. Hypertension is known to be associated with higher levels of blood glucose and triglycerides, higher BMI, lower levels of high-density lipoprotein cholesterol and insulin resistance than the normotensives.[5,6] All these parameters are associated with cardiovascular and cerebrovascular events. Medical students with increased stress, and therefore, increased BP levels are at risk of developing hypertension in future which is associated with increased morbidity and mortality. Management of stress is of utmost importance to prevent medical students going into complication because of elevated BP. Risk factor identification of stress in medical students should be done in an earlier stage, and lifestyle modification such as yoga,[12] meditation, and exercise should be advocated to prevent stress and hypertension-related complications. Listening to music has shown to be one of the effective modalities to reduce stress and anxiety.[13,14] All these modalities probably work by reducing the sympathetic tone in the subjects.

Even though studies have been conducted in the past to assess the level of stress in medical students, the questionnaire used was not specific to assess the level of stress in medical students. The strength of the present study is that MSSQ, a validated tool to assess stress level in medical students was used which can identify the specific source of stress in medical students. The present study also has a limitation in the form of sample size.

CONCLUSION

Medical students have mild to moderate degree of stress, and there is a positive correlation between ARS, GARS, and DBP. Proactive measures are to be taken to prevent the progression of elevated BP to hypertensive levels, to prevent complications related to hypertension and for well-being of the students.

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