

Original research article

Evaluation of Examination Stress on Cardiovascular Parameters of Indian Medical Students

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Abstract

Medical students are subjected to a demanding curriculum and stressful socialization and can encounter a plethora of psychological problems during their MBBS course. The present study aims to investigate the examination stress levels by monitoring their cardiovascular parameters such as blood pressure two months before commencement of exam and just before commencement of the examination. An attempt was made to statistically decipher significant correlations with respect to blood pressure changes. There was a significant difference in the pre-exam and exam period results in blood pressure.

Keywords: Medical students stress, Indian medical students, blood pressure

Introduction

Medical students go through a rigorous training curriculum undergoing various levels of stress of the MBBS course. A plethora of factors ^[1] such as academic pressure, sleep deprivation ^[2], exposure to suffering ^[3], peer pressure ^[4] etc. add to their stress. The demands placed on medical trainees pose a challenge to personal wellbeing, leading to burnout and erosion of empathy ^[5]. Medical students may experience stress when curricular demands exceed their resources to deal with them ^[6]. Previous studies show that medical students undergo more stress than non-medical students from other fields of study at their age ^[7]. Human body responds to autonomic functions such as blood pressure and heart rate during stress conditions ^[8]. In the present work, an attempt has been made to evaluate the stress levels by studying cardiovascular parameters like blood pressure changes before and during the examination period.

Materials and Methods

About 69 first year and second year MBBS students from a tertiary care hospital in Mumbai (India) were included in the study. The study was conducted after obtaining the institutional ethics committee approval. Participation of the students was entirely voluntary and a written consent was obtained from them after explaining the purpose of the study. Blood pressure and pulse rate were recorded from the subject twice. First recording was done at least two months prior to their practical examinations. The second recording was done on the same subjects about half an hour before the commencement of the practical examinations. Both systolic and diastolic blood pressure were recorded in triplicate with a gap of 1min by auscultatory method using a mercury sphygmomanometer in sitting position. Pulse rate was

also simultaneously recorded for the subjects. Subjects did not have any food or stimulants at least 2 hours before the study. Mean & SD of age, height, weight, systolic blood pressure (SBP) and diastolic blood pressure (DBP) were determined. The data was statistically evaluated with Mann-Whitney U test. Significant values were recorded at a level where $p < 0.05$.

Results

The present work evaluated the stress in medical students. To understand the demographics of the study group, the weight (in kg), age (in years) and height (in cm) of all the subjects were recorded and the mean and standard deviation were calculated as shown in Table 1.

Table 1: Demographics of study group

Parameter	Weight (kg)	Height (cm)	Age (years)
Mean	65.26	166.41	19.55
Standard deviation	13.50	7.75	0.50
N	69	69	69

Blood pressure readings were done at least two months prior to their practical examinations & the second recording was done on the same subjects about half an hour before the commencement of the practical examinations. About 69 students participated in the study.

Table 2: Comparison of the SBP and DBP between pre-exam and examination period

Parameter	Systolic Blood pressure (2 months Before exam)	Diastolic Blood Pressure (2 months Before exam)	Systolic Blood pressure (Exam period)	Diastolic Blood Pressure (Exam period)
Mean	113.83	73.59	129.88	80.71
Standard deviation	9.56	8.03	14.74	8.44
N	69	69	69	69

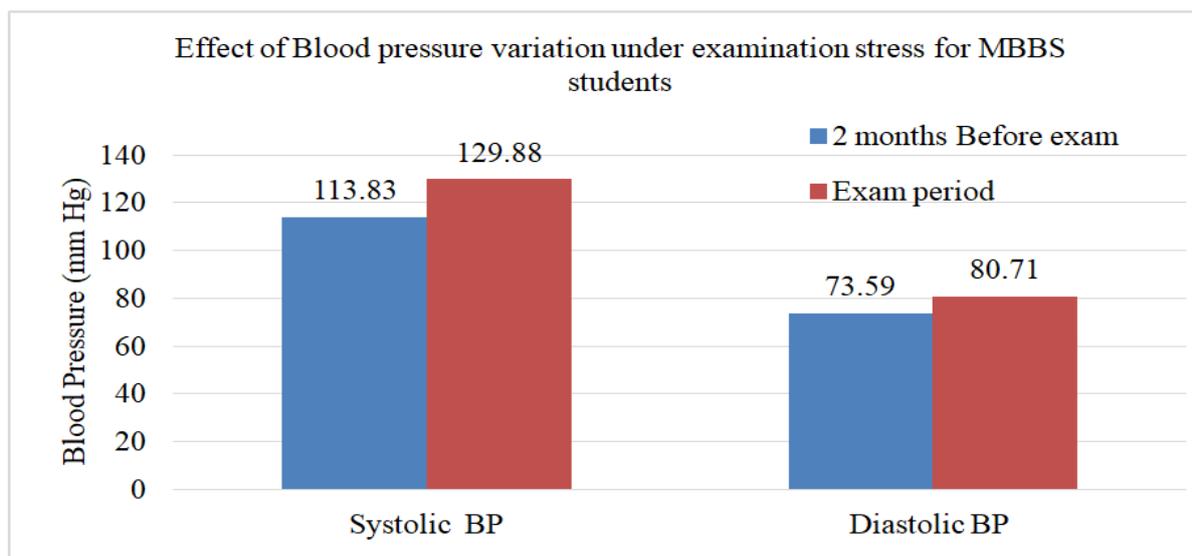


Figure 1: Effect of Blood pressure before exam and during exam period in MBBS students

Mann-Whitney U Test was carried out to evaluate if there is a significant increase in stress before the examination (two months before exams) and during the exam period (half an hour before exam commenced) using a representative cardiovascular parameter like systolic and diastolic blood pressure measurements for investigation and are tabulated in Table 3.

Table 3: Mann-Whitney U Test for systolic and diastolic blood pressure

	Mann-Whitney U - value	p-value	Z-ratio	Significant / Not-significant
Systolic blood pressure (2 months before exam) vs Systolic blood pressure (Exam period)	866	9.832554e-11 (p-value is < .00001)	-6.44703	result is significant at p < 0.05.
Diastolic blood pressure (2 months before exam) vs Diastolic blood pressure (Exam period)	1308	0.000004 (p-value is < .00001)	-4.56488	result is significant at p < 0.05.

Discussion

About 69 first year and second year MBBS medical students were evaluated for exam related stress. Demographically, all students were in the age bracket of 19 to 20 years (19.55 ± 0.5 years) with a height range of 166.41 ± 7.75 cm and a weight of 65.26 ± 13.5 kg. Any student with a history of blood pressure related or any students taking regular medicines for any ailments were excluded from the study. Blood pressure readings were recorded at least two months prior to their practical examinations & the second recording for the same subject was recorded about half an hour before the commencement of the practical examinations. As recorded in Table 2, the mean systolic blood pressure two months before the exam was 113.83 ± 9.56 mm Hg. However, when the systolic blood pressure was recorded just before the exam commenced, the mean readings had increased to 129.88 ± 14.74 mm Hg. This suggests an increase of about 14% in systolic blood pressure. Likewise for the diastolic measurements, the mean readings two months before the exam were 73.59 ± 8.03 mm Hg and just before the exam commenced it was 80.71 ± 8.44 suggesting an increase of about 9.7% from the previous reading.

Mann-Whitney U test statistical evaluation using systolic and diastolic blood pressure readings was done to check if there is an increase in examination stress levels before 2 months and before commencement of the exams. The test statistics for systolic blood pressure for the Mann-Whitney U test were: $z = -6.447$ ($p = 9.832554e^{-11}$). The p-value is < 0.00001. The result is significant at $p < 0.05$. This indicates showing that the stress levels increase during the examination period as compared to the pre-examination period (before 2 months). Under stress, the hypothalamus acts on adrenal glands to produce adrenalin and cortisol [9] and release them in to the blood stream, which leads to increases the heart rate, BP and metabolism [10].

The present study showed that the stress was highly prevalent among the MBBS medical students. This study is a snapshot indicator of the examination stress in medical schools in India and it can help the medical institutes to deal with the stress of the students by means of

small training or support programs in the form of yoga training or meditation program as a remedial measure to minimizing and will thus help the students to deal with their academic burden in future.

Conclusion

Physiological stress stimulates symphoadrenal activity of “flight or fight” which causes an increase in blood pressure. The results show an increase in both systolic and diastolic blood pressure during examination period. Expanding the study to multiple topics and subjects in varying complexities could validate the robustness of the study. Such investigations could help understand new training methodologies for medical physiology students and help them train adequately and holistically considering demand of the time and changing needs of the society especially in worldwide societal teaching disruptions like COVID-19. Small stress remedial programs for medical students with yoga and meditation can help minimize this societal obstacle.

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