EFFECT OF PRE-EXAMINATION STRESS ON PULSE RATE AND BLOOD PRESSURE IN FIRST YEAR MEDICAL STUDENTS OF ANDHRA MEDICAL COLLEGE
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ABSTRACT

BACKGROUND
Pre-examination stress is a common condition faced by the students prior to exams and is emerging as a major health problem, especially in medical students. The present study was undertaken to evaluate the effect of pre-examination stress on autonomic functions like pulse rate and blood pressure in the first M.B.B.S. students.

MATERIALS AND METHODS
The study group consisted of 100 medical students studying 1st M.B.B.S. in Andhra Medical College, Visakhapatnam. Among them, 45 students were males, 55 students were females. Their arterial blood pressure and pulse rate were measured one month prior to examination and again one week before examination. The data was analysed using student’s paired ‘t’ test.

RESULTS
In the present study, the results were consistent with early clinical studies reporting that there is increase in pulse rate, systolic blood pressure, diastolic blood pressure, one week before examination compared to values of one month before examination.

CONCLUSION
Majority of the students were under stress prior to examination. Stress produced a significant increase in the pulse rate, systolic blood pressure and diastolic blood pressure among the students. Relaxation techniques like meditation, yoga, breathing exercises, appropriate diet and physical exercises can be recommended to students.

KEYWORDS
Pre-examination Stress, Pulse Rate (PR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP).


BACKGROUND
The term stress was first used in a biological context by the endocrinologist Hans Selye. He defined stress in 1936 as "the non-specific response of the body to any demand for change".1 It is a condition that puts mind in a state of fear or anxiety. It is a sum of physical, mental, and emotional tensions on a person. Education and training in medical colleges has always been regarded as highly stressful. Medical students are usually under stress due to a variety of reasons like vast curriculum, academic competition, examinations etc. Many physiological studies have shown that stress from any source can influence on the endocrine, haemopoietic and immune systems.2 Studies have proved that compared to the general population medical students are the most distressed,3 face unique academic challenges that make them more vulnerable to stress and anxiety than students in other faculties.4 Competitive environments, ambition for higher achievements, family and peer pressure also do increase the extent of stress in the life of a medical student.5

Stress of any form is known to produce definable mental and physiological reactions in the body like alterations in different biological functions especially the heart rate and blood pressure.6 Stress, may it be emotional, physical or biological, evokes an integrated response of sympathoadrenal medullary system and hypothalamic–pituitary–adrenal cortex axis. To some extent stress in itself is helpful in coping with situations but too much of it can reduce the performance.7 This study was undertaken to observe the effect of pre-examination stress on pulse rate and blood pressure on first year M.B.B.S students undergoing academic examination.

MATERIALS AND METHODS
The present study was carried out in the Department of Physiology, Andhra medical college, Visakhapatnam among the first year M.B.B.S students of 2017-2018 batch during June 2018. Out of 200 students, 100 students between 17-19 years age group participated in the study. Among them,
45 students were males and 55 students were females. After explaining the purpose of the study, informed consent was obtained from all the students and were subjected to test the anthropometric measurements height in cms and weight in kgs. BMI was calculated for all the students. The students who were having history of any chronic illness were excluded.

One month prior to the academic examination, the students were subjected to test the hemodynamic parameters like blood pressure and pulse rate after 10 min of rest in sitting position in a quiet room. BP was measured 3 times by auscultatory method using mercury sphygmomanometer with a gap of 1 min between the readings and the average of 3 readings was taken. Pulse rate was determined by palpating the radial artery for one minute. Then, one week prior to academic examination, pulse rate and blood pressure were again recorded in the same quiet room to avoid the emotional and psychological stresses.

Statistical Analysis
Analyses were conducted using SPSS v20 software. The descriptive statistics like mean and standard deviation were calculated. Statistical significance of the data was measured by applying Student’s paired t-test appropriately. p<0.05 was considered statistically significant.

RESULTS
A total of 100 first year medical students were included in the study having a mean age of 18.11±0.45 years. Out of 100 students, 45% students were boys and 55% students were girls. Statistical analysis using student's Paired t-test revealed that there was a significant increase in hemodynamic parameters like pulse rate, systolic blood pressure, diastolic blood pressure one week before exam than one month before exam.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Yrs.)</td>
<td>18.11</td>
<td>0.45</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>158.17</td>
<td>5.57</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>58.60</td>
<td>8.54</td>
</tr>
</tbody>
</table>

Table 1. Mean and SD Values for Age, Height and Weight of 1st MBBS Both Male and Female Students (n=100)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>One Month Before Exam</th>
<th>One Week Before Exam</th>
<th>t-test</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse Rate</td>
<td>76.62±5.49</td>
<td>79.47±5.23</td>
<td>-14.722</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Systolic Blood Pressure</td>
<td>109.31±5.64</td>
<td>112.80±5.38</td>
<td>-6.962</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Diastolic Blood Pressure</td>
<td>73.91±3.91</td>
<td>76.64±4.44</td>
<td>-6.323</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Table 2. Comparison of Pulse Rate, SBP and DBP in Male Students
One Month Before and One Week Before Exam (All Values Are Mean± SD)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>One Month Before Exam</th>
<th>One Week Before Exam</th>
<th>t-test</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse Rate</td>
<td>78.20±5.46</td>
<td>81.53±6.96</td>
<td>-2.792</td>
<td>p&lt;0.006</td>
</tr>
<tr>
<td>Systolic Blood Pressure</td>
<td>106.95±14.05</td>
<td>112.22±5.52</td>
<td>-2.589</td>
<td>p&lt;0.011</td>
</tr>
<tr>
<td>Diastolic Blood Pressure</td>
<td>75.31±3.66</td>
<td>77.22±4.46</td>
<td>-2.468</td>
<td>p&lt;0.015</td>
</tr>
</tbody>
</table>

Table 3. Comparison of Pulse Rate, SBP and DBP in Female Students
One Month Before and One Week Before Exam (All Values Are Mean± SD)

<table>
<thead>
<tr>
<th>Time of Exam</th>
<th>Male</th>
<th>Female</th>
<th>t-test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR</td>
<td>76.62±4.94</td>
<td>78.20±5.46</td>
<td>-1.502</td>
<td>p&lt;0.136</td>
</tr>
<tr>
<td>One week before exam</td>
<td>79.47±5.23</td>
<td>81.53±6.96</td>
<td>-1.642</td>
<td>p&lt;0.104</td>
</tr>
<tr>
<td>SBP</td>
<td>109.31±5.64</td>
<td>106.95±14.05</td>
<td>1.058</td>
<td>p&lt;0.292</td>
</tr>
<tr>
<td>One week before exam</td>
<td>112.80±5.38</td>
<td>112.22±5.52</td>
<td>0.529</td>
<td>p&lt;0.598</td>
</tr>
<tr>
<td>DBP</td>
<td>73.91±3.91</td>
<td>75.31±3.66</td>
<td>-1.845</td>
<td>p&lt;0.068</td>
</tr>
<tr>
<td>One week before exam</td>
<td>75.64±4.44</td>
<td>77.22±4.46</td>
<td>-1.766</td>
<td>p&lt;0.081</td>
</tr>
</tbody>
</table>

Table 4. Gender Difference in The Effects of Pre-Examination Stress on PR, SBP, DBP

Table 1 shows the mean and standard deviation of parameters like age, height, weight of all students. Table 2 shows increase in mean pulse rate from 76.62±4.94 one month before exam to 79.47±5.23 one week before exam. On applying t-test the difference was found to be statistically significant (p <0.0001). There is increase in mean SBP from 109.31±5.64 mmHg one month before exam to 112.80±5.38 mmHg one week before exam and the difference was found to be statistically significant (p <0.0001).
Table 3 shows an increase in mean pulse rate from 78.20±5.46 one month before exam to 81.53±6.96 one week before exam. On applying t-test, the difference was found to be statistically significant (p<0.006). There is an increase in mean SBP from 106.95±14.05 mmHg one month before exam to 112.22±5.52 mmHg one week before exam and the difference was found to be statistically significant (p<0.011). There is an increase in mean DBP from 75.31±3.66 mmHg one month before exam to 77.22±4.46 mmHg one week before exam and the difference was found to be statistically significant (p<0.015) in female students. Table 4 shows comparison of mean PR, mean SBP, mean DBP between the genders one month before and one week before start of exam. With regard to Pulse rate, males showed slightly lower value than the females. And the difference was found to be not statistically significant both one month before (p<0.136) and one week before start of exam (p<0.104). With regard to SBP, males showed slightly higher value than the females and the difference found to be not statistically significant both one month before (p<0.292) and one week before start of exam (p<0.598). With regard to DBP, males showed slightly lower value than the females and the difference was found to be not statistically significant both one month before (p<0.068) and one week before start of exam (p<0.081).

**DISCUSSION**

Pre-examination stress is one of the most widely suffered problems in medical students throughout the world. It is a feeling of pressure tension that many medical students feel before and coming up to academic examination time. This study supports many findings of the previous studies where majority of the medical students experience some levels of anxiety before examinations. In our study there was a significant increase in mean PR, SBP, and DBP in all the students one week before examination when compared with the values one month before examination. This could be explained by the stimulation of the adrenergic nervous system that lead to release of nor-epinephrine at the post synaptic neuron and epinephrine from adrenal medulla that result in activation of α1, β1 and β2 receptors consequently causing elevation of systolic blood pressure. These results are similar to the findings of Freychuss et al (1988) who attributed this to increased epinephrine secretion and findings of other studies.

Increase in pulse rate and blood pressure is important sympatho-adrenal response to physiological stressful experience. Increased level of plasma epinephrine and nor-epinephrine during stress by their action on beta receptors of heart increases heart rate and systolic blood pressure. The release of norepinephrine causes vasoconstriction of arterioles which raises peripheral resistance and thereby increase the diastolic blood pressure.

In this study, between the male and female students the difference of mean PR, SBP, and DBP one month before and one week before start of exam was found to be not statistically significant. As per comparison between genders, the study would have provided better and wider results if the sample size taken was large.

**CONCLUSION**

Almost all people, especially urban citizens, are under stress. Over-work, economic uncertainty, health care are major sources of stress that the people may have every day. To these types of stress sources, studentship can be added because of curriculum, academic competition, examinations. These are all enough to increase the anxiety levels which cause high blood pressure and heart rate. Students can be recommended relaxation techniques like meditation, yogasana, proper diet and physical exercises. Government education system needs to develop good study evaluation techniques which cause less stress among students and teachers and provide better support for students struggling for their well-being.

**REFERENCES**


