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Acute effect of examination stress on cardiovascular parameters

[*1] Abhishek Acharya, [2] Meghshyam Sharma
[1] Senior Demonstrator, Department of Physiology, RNT Medical College, Udaipur, Rajasthan Jaipur, India
[2] Associate professor, Department of Physiology, RNT Medical College, Udaipur, Rajasthan Jaipur, India

Abstract
Medical students, particularly the first year students who are in the transition phase of their life, are the most vulnerable for developing stress. Many researchers have reported a relationship between stress and blood pressure. In fact, the natural reaction of the cardiovascular responses to the stress is the increase in the heart rate. Hence the present study has been conducted to shown acute effect of examination stress on cardiovascular parameters**.** This study was carried upon 70 male medical students who were appearing in university practical examination. Two recordings of blood pressure and pulse rate were recoded of those students. First Pre examination recording of Blood Pressure and Pulse rate of the students were taken thirty minutes prior to the university Practical and Viva-Voice examination and second Post examination recording of blood pressure and pulse rate of the students were taken just after one day of the examination. In our study we found that pre examination values of pulse rate and Blood Pressure was higher than the post examination values.

Keywords: stress, pulse rate, systolic blood pressure, diastolic blood pressure and medical students

Introduction
Exams. We all have to do them. Working towards exams can make us feel a lot of pressure, especially at university where we're aiming for a degree. The curriculum studied by the medical students is vast and time in which they have to complete their studies is very short, therefore medical students are thought to be under stress, especially before their examinations.

One of the important sources of examination stress in students is the great expectation of parents for achieving good marks in their examination. In recent time, there have appeared several news regarding the increasing suicide rate among students of as young age as 18 year old [1].

Many researchers have reported a relationship between stress and blood pressure. In fact, the natural reaction of the cardiovascular responses to the stress is the increase in the heart rate [2]. Stress starts while the emotional, environmental, physical and social needs of the individuals compete with one another, and exceed the ability of the individual. Short-term stress (acute) increases the blood pressure.

Medical students undergo tremendous stress during various type stages of the MBBS course. The main cause of stress is adapting to new life, which they suddenly landed in abrupt changes from high school to college and new advancements has also added to the burden of medical students. In a medical student, the situation is aggravated by the added pressure to secure better grades than his securing residency program of his choice.

Medical students, particularly the first year students who are in the transition phase of their life, are the most vulnerable for developing stress. At the time of 1st MBBS university practical examination student has to face Internal and External examiners and hence the present study was carried out on first year medical students.

Aims of this study was to observe the effect of Practical and Viva-voice examination stress on Blood Pressure and pulse Rate in first year MBBS.

Material and Methods
The present study was carried out in Department of Physiology, R. N. T. Medical College, Udaipur, among the 1st MBBS students of Batch 2016-2017. This study was carried out on seventy male students. Two recordings of blood pressure and pulse rate were recoded of those students.

- First Pre examination values of blood pressure and pulse rate of the students were taken thirty minutes prior to the university Practical and Viva-Voice examination.
- Second Post examination values of blood pressure and pulse rate of the students were taken just after one day of the examination.

First year normotensive male students appearing in university practical examination (Who agreed to participate through verbal consent) were included in the study.

Blood Pressure: Both Systolic and Diastolic Blood Pressure were recorded. The Blood Pressure was recording using mercury sphygmomanometer in sitting position.

Pulse Rate: The right Radial pulse was felt with tips of first three fingers by compressing the radial artery of the right arm of subject in sitting position.

The data collected was analyzed using Student's paired t- test. Significant values were recorded at a level where $p<0.05$.

Result
Comparison of the Pulse rate, SBP and DBP between pre and post examination value is shown in table-1.

Pulse Rate (PR) - The mean value of pulse in pre examination recording (83.22) is higher than the mean value of post examination (78.68). The difference of mean of pulse rate was significant between the values of pre examination and post examination recordings, ($p<0.0001$).

Systolic Blood Pressure (SBP) - The mean value of SBP in pre examination recordings (123.6) is higher than the mean value of post examination (120.9). The difference of mean of SBP was significant between the values of pre examination and post recordings. ($p<0.0001$).

Diastolic Blood Pressure (DBP) - The mean value of DBP in pre examination recording (81.44) is higher than the mean value of post examination (80.92). The difference of mean of SBP was not significant between the values of pre examination and post examination ($p=0.0571$).

Table 1: showing the comparison of mean of value Pulse rate, SBP and DBP between pre examination and post examination.

Parameters		Mean± S.D	t Value	P
Pulse Rate	Pre Examination	83.24 ± 5.282	6.174	<0.0001
	Post Examination	78.68 ± 3.867		
SBP	Pre Examination	123.6 ± 5.559	5.466	<0.0001
	Post Examination	120.9 ± 4.732		
DBP	Pre Examination	81.44 ± 5.096	1.949	0.0571
	Post Examination	80.92 ± 4.085		

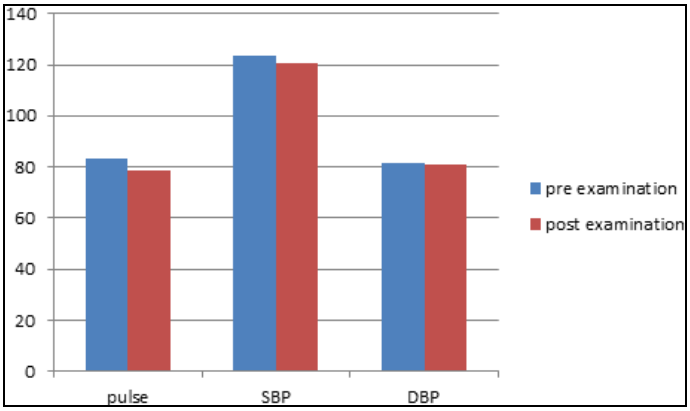

Fig 1: Showing the Mean value of Pulse Rate, SBP and DBP in pre examination and post examination recording.

Discussion

The pre examination anxiety and fear are accompanied by change in the number of different physiological parameters. Examination stress is a feeling of tension that many medical students feel before and coming up to examination time. It usually occurs during the revision period before examinations and immediately before and during examination. Though moderate amount of stress is essential for maintaining motto for better performance and preparation in examination, extreme stress can be harmful to body and mind. This study supports many findings of the previous studies in that majority of the medical students experience some levels of anxiety before examinations [3, 4, 5, 6]. The systolic blood pressure was significantly higher in the pre-examination period than the record when there were post examination periods. This could be explained by the stimulation of the adrenergic nervous system that lead to release of catecholamine in particular nor-adrenaline at the post synaptic neuron and adrenaline or epinephrine from adrenal medulla that result in activation of $\alpha1$,$\beta1$ and $\beta2$ receptors consequently elevation of systolic blood pressure [7].

The present study observed a significant increase in pulse rate thirty minutes prior to the examination. The significant increase in both systolic blood pressure and pulse rate observed prior to exam possibly as a result of sympathetic activation. This is in consistent with the findings of Freychuss *et al.* and Malathi *et al.* who contributed it to increased epinephrine levels [8, 9]. The dropping of the systolic blood pressure once the student complete his examination can be explained that the reduction results from decreased in peripheral arteriolar resistance and or cardiac output by a variety of mechanism at a variety of sites such as: Dilatation of resistance vessels, the heart pumps against lower resistance. Dilatation of capacitance vessels, reduction of venous return to the heart to reduce cardiac output. Reduction of sympathetic drive to the heart leads to lower cardiac output especially in response to stress.

Majority of the undergraduate medical students were observed to be under stressed prior to examination. Stress produced a significant elevation in the systolic blood pressure as well as the pulse rate among the students. This alteration can be controlled by the systemic defense mechanism that are naturally present in our body.

Conclusion

Many medical students were observed to be under stressed prior to examination. The examination is a situational stress resulting change in cardiovascular parameters. Acute Stress of examination produced a significant elevation in the systolic blood pressure and the pulse rate among the students.

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