

**EFFECTS OF EXAM STRESS AMONG MEDICAL STUDENTS ON BLOOD PRESSURE & PULSE RATE. A STUDY AT PEOPLES UNIVERSITY OF HEALTH AND SCIENCES FOR WOMEN, SHAHEED BENAZIR ABAD.**

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**ABSTRACT**

**Objective:** To determine and compare the effects of Examination stress among medical students on blood pressure & pulse rate at PUMHSW-Shaheed Benazir Abad. **Design of study:** This was comparative cross-sectional study. **Place & Duration:** The research was carried out at the Department of Physiology, Peoples University of Medical & Health Sciences for Women, Shaheed Benazir Abad, From April 7th, 2019 to October 6th, 2019. **Materials and Method:** A total of 110 students of first & Second year MBBS were included for this study having no any illness, by the non-probability randomized sampling technique. All students were divided into two equal (55-students in each) groups A and B first & second year MBBS respectively, blood pressure was measured by mercury sphygmomanometer and pulse was counted by palpatory method for one minute as standard during pre-exam and post exam period. **Results:** This study showed that systolic Blood Pressure  $\pm$  SD before examination of student's of *first year* was mean  $111.72 \pm 9.19$  mmHg and  $116.0 \pm 10.81$  mmHg during exam which was higher with p value of 0.001. whereas in the *second year* students the mean Systolic Blood Pressure  $\pm$  SD during examination of students was  $122.27 \pm 44.78$  mmHg which was higher as compared to before examination mean Systolic Blood Pressure  $\pm$  SD was  $106.23 \pm 15.47$  mmHg ( $p < 0.05$ ). The mean Diastolic Blood Pressure  $\pm$  SD during examination of students of first year was  $76.4545 \pm 8.53$  mmHg which was higher as compared to before examination mean Diastolic Blood Pressure  $\pm$  SD was  $73.3636 \pm 8.05$  mmHg ( $n = 55$ ,  $p$  value = 0.0001). Whereas mean diastolic BP of seconds years students was  $71.7091 \pm 7.83$  mmHg before exam and higher values noted during exam mean was  $75.6727 \pm 14.51$  mmHg ( $p = 0.001$ ). Mean Pulse rate  $\pm$  SD during examination of all students including first year was  $82.09 \pm 12.58$  mmHg before exam Pulse rate  $\pm$  SD was  $80.16 \pm 10.00$  mmHg ( $n = 55$ ,  $p$  value = 0.0001). In the second year students this rate was  $72.12 \pm 6.90$  mmHg before and  $75.30 \pm 8.96$  mmHg during examination,  $p$  value = 0-045. **Conclusion:** Majority of students were in examination stress, and this stress significantly affected junior female first year students in comparison of second year students and raised their pulse rate, Systolic & Diastolic blood pressure.

**Key words:** Examination stress, Blood Pressure, Medical Students.

**How to cite this article:** Sheikh R<sup>1</sup>, Rahu HN<sup>2</sup>, Dahri MNN<sup>3</sup>, Memon AH<sup>4</sup>, Shah GM<sup>5</sup>, Pathan AK<sup>6</sup> **EFFECTS OF EXAM STRESS AMONG MEDICAL STUDENTS ON BLOOD PRESSURE & PULSE RATE. A STUDY AT PEOPLES UNIVERSITY OF HEALTH AND SCIENCES FOR WOMEN, SHAHEED BENAZIR ABAD.** JPUMHS;2020;10:04,129-133.

**DOI:** <http://doi.org/10.46536/jpumhs/2020/10.02.273>

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**INTRODUCTION**

Examination and part of academic curriculum, are highly stressful and tiresome for all students at every educational level. Physiological effects of stress can change the thinking ability, behavior and thoughts of the students during examination.

Physiological studies show that stress can alter the blood pressure and pulse rate and blood cells parameters in healthy individuals. This study has been conducted to determine whether examination in medical university is stressful enough to produce such changes. "Stress can also be described as the difference in environment and

people's capacity to adapt appropriately. Stress may be austerity or trouble. Eustress is excellent stress; it is a dynamic stress that encourages an individual to continue functioning in the best possible way when that stress is no longer manageable than stress is overcome or trouble. Stress in humans outcomes from human-environment relationships which are considered to stress, override or threaten their adaptive capabilities. When stress improves function (physical or mental for example, through training or challenging work), stresses which are not resolved through cope or adjustment, considered distress and which can cause anxiety, or withdrawal (depression) can be considered to be persistent.<sup>1</sup> The potential effects of poor stress can be: heated, tense, loose, readily dull, frightened or troubled. Inadequate stress can contribute sometimes to a large number of psychological disorders, such as dejection, fear, drug abuse and even suicide.<sup>2</sup> Excessive data burdens leave little chance for relaxation and recreation, and sometimes lead to severe sleep deprivation.<sup>2</sup> It provides several stressors that can trigger damage to judgment, reduced attendance, absence of trust, fear and depression.<sup>3</sup> Interestingly Linn & Zeppa have proposed that some stress is required to learn in medical schools.<sup>4</sup> Long-term distress affects the body drastically and is likely to lead to various diseases.<sup>5</sup> In this report, it is presumed that the concept is the one concerning disturbance, wherever the word stress is written. Examination stress is a psychological disorder in which, before, during, or after an examination or other evaluation, students experience intense discomfort and anxiety to such a degree that this anxiety causes decreased performance or interferes with normal learning. Examinations are used to test candidates because there is no other way to guarantee that candidates have enough knowledge and understanding to pass an assessment without the possibility that they have been inappropriately assisted by others for four reasons, research suggests that examinations are stressful for students<sup>6</sup> consequences; markers of self-esteem; judgments from others; and fear appeals by teachers. The pressure to perform well in the examination and time allocated makes academic environment very stressful.<sup>7</sup> In stress analysis, academic exams have also been used because they are "predictable."<sup>8</sup> While most of the study results support the negative relationship<sup>9</sup> between stress and academic achievement, few studies conclude against them. Irene J. Kim Park<sup>10</sup> reported a major positive relationship between college students' stress and academic success. In stress studies, academic exams have also been used because they are 'predictable, structured and distinct representations of real-life stressors.'<sup>11</sup> Stress activation of the hypothalamic pituitary-adrenocortical-axis leads to changes in heart rate, blood pressure, breathing depth, and body temperature. Physiological studies have shown that stress can affect the endocrine, hemopoietic and immune systems due to any cause.<sup>12</sup> Prolonged stress is associated with the activation

of hypothalamo pituitary adrenal axis, and increases in the release of hormones such as adrenaline and cortisol. These hormones prepare the body for fight or flight reaction. Stress and anxiety are such strong feelings that they are followed by reduced sleep time and autonomic nervous system activation. There are changes in physiological parameters as a consequence. These modifications indicate the reactivity of the person to stressful conditions. Changes in systolic blood pressure rose from a mean of 120 to 136 mmHg, diastolic from 81 to 92 mmHg, and pulse rate from 84 to 92 beats per minute are examples of these parameters.<sup>13</sup> The cardiac rate in ordinary adults is controlled by the sinus electrical impulses (SA), the heart pacemaker. The SA node is regulated and affected both by the sympathetic and para sympathetic processes by the autonomic nervous system. A survey of the influencing variables in the cardiac rate by classified cardiac rate determinants in two categories: unmodifiable and physiological.<sup>14</sup> Posture, blood pressure, exercise, obesity, mental stress, smoking and the use of spirit are all determinants of physiology. However, it is not very definite to measure neural cardiovascular alterations, despite the fact that it is easy to quantify the heartbeats. However, significant differences in the mean core rate before, during and after stressful treatment simulations were observed in a pilot study.<sup>15</sup>

## MATERIALS AND METHOD:

This Cross sectional comparative research was conducted at Department of Physiology, Peoples University of Medical & Health Sciences for Women, Shaheed Benazir Abad. The research study was approved and accepted by Ethical Review Committee of PUMHSW-SBA. Normal female Junior students of MBBS (First & second year) were included comprises of total 110 numbers, then two groups A (first year) and B (second year) were made each of 55 students, during pre-exam and post exam period blood pressure and pulse was measured by mercury sphygmomanometer and by palpatory method respectively. After the collection of the data, it was analyzed by SPSS version 23. All the continuous variables were analyzed by the t-test for mean standard deviation. All the numerical variables were analyzed by Student's t test. Final results were presented by using tables, graphs, and charts

## RESULTS:

In this study, mean Systolic Blood Pressure  $\pm$  SD during examination of students including first year was  $116.0 \pm 10.81$  mmHg which was higher as compared to before examination mean Systolic Blood Pressure  $\pm$  SD was  $111.72 \pm 9.19$  mmHg. There was highly significant increase of Systolic Blood Pressure during examination as compared to before examination among the students of first year ( $n = 55$ ,  $p$  value = 0.0001). See Table No:1 & Graph 1. In this study, mean Systolic Blood Pressure  $\pm$  SD during examination of students

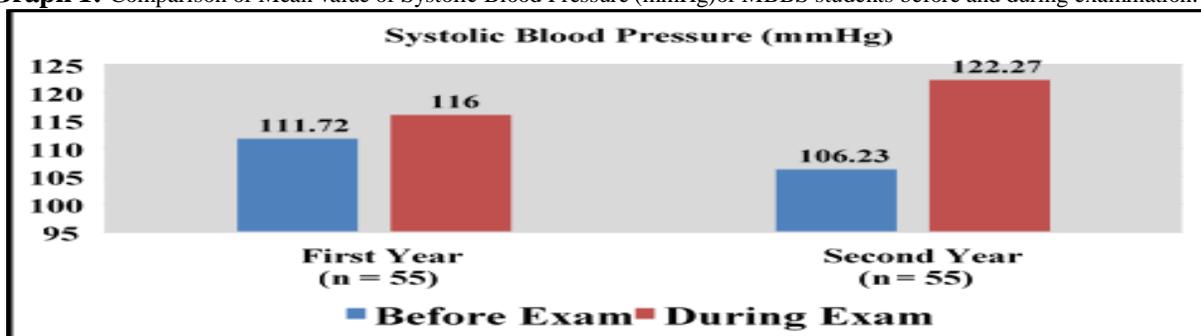
including second year was 122.27±44.78 mmHg which was higher as compared to before examination mean Systolic Blood Pressure ±SD was 106.23±15.47 mmHg. There was highly significant increase of Systolic Blood Pressure during examination as compared to before examination among the students of second year (n = 55, p value = 0.0001). Table No.1.Effect of examination stress on Diastolic Blood Pressure In this study, mean Diastolic Blood Pressure ± SD during examination of students including first year was 76.4545±8.53 mmHg which was higher as compared to before examination mean Diastolic Blood Pressure ±SD was 73.3636±8.05 mmHg. There was a highly significant increase of Diastolic Blood Pressure during examination as compared to before examination among the students of first year (n = 55, p value = 0.0001). Table No. 2 In this study, mean Diastolic Blood

Pressure ± SD during examination of students including first year was 82.09±12.58 mmHg which was significantly higher as compared to before examination mean Pulse rate ±SD was 80.16±10.00 mmHg. There was highly significant increase of Pulse rate during examination as compared to before examination among the students of first year (n = 55, p value = 0.0001). Table No.3 In this study, mean Pulse rate ± SD during examination of all students including second year was 75.30±8.96 mmHg which was significantly higher as compared to before examination mean Pulse rate ±SD was 72.12±6.90 mmHg. There was a significant increase of Pulse rate during examination as compared to before examination among the students of second year (n = 55, p value =0.045). Table: 3

**Table: 1 Comparison of Mean value of Systolic Blood Pressure (mmHg) MBBS students before and during examination (n=110)**

Systolic Blood Pressure (mmHg)	Before Examination	During Examination	P value
First year (n = 55)	111.72±9.19	116.0±10.81	0.0001**
Second year (n = 55)	106.23±15.47	122.27±44.78	0.0001**

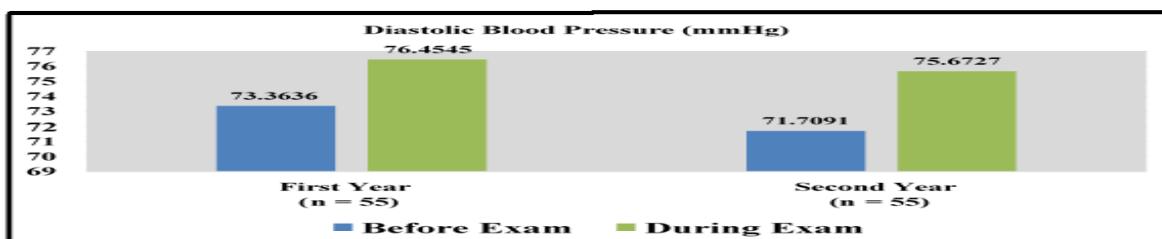
**Graph 1:** Comparison of Mean value of Systolic Blood Pressure (mmHg) of MBBS students before and during examination.



Diastolic Blood Pressure (mmHg)	Before Examination	During Examination	P value
First year (n = 55)	73.3636±8.05	76.4545±8.53	0.0001**
Second year (n = 55)	71.7091±7.83	75.6727±14.51	0.0001**

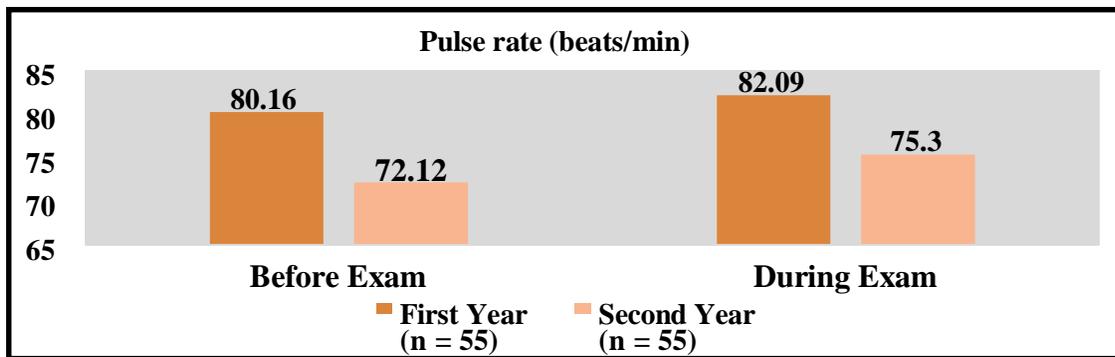
\*\*P value is highly significant (student's t test)

**Table No:2 Comparison of Mean value of Diastolic Blood Pressure (mmHg) MBBS students before and during examination (n=110)**



**Graph 2:** Comparison of Mean value of Diastolic Blood Pressure (mmHg) of

MBBS students before and during examination MBBS students before and during examination.



Graph 3: Mean value of Pulse rate (beats/min) of MBBS students before and during examination

Pulse rate (beats/min)	Before Examination	During Examination	P value
First year (n = 55)	80.16±10.00	82.09±12.58	0.0001**
Second year (n = 55)	72.12±6.90	75.30±8.96	0.045*

Table N0: 3 Mean value of Pulse rate (beats/min) of MBBS students before and during examination

\* p value is significant (student's t test)

\*\* p value is highly significant (student's t test)

#### DISCUSSION:

The increased risk of cardiovascular diseases is associated with elevated blood pressure. Stress can cause hypertension to produce large quantities of vasoconstrictor hormones that increase blood pressure through repeated elevation of blood pressure as well as stimulation of the nervous system. In addition, the impact on blood pressure is multiplied when one risk factor is combined with another factor that causes stress.<sup>16</sup> This study was carried out on 110 MBBS medical students of first year and second year at PUMHSW Shaheed Benazir Abad to find out the impact of examination stress on blood pressure and pulse rate. **Impact of stress on physiological parameters:** Present study showed that stress of University examination in 1<sup>st</sup> & 2<sup>nd</sup> year students of PUMHSW was significant enough to produce changes due to stress in the systolic and diastolic arterial pressure and pulse rate, both variables checked at start of exam days than at before the examination. Similarly, Fayeze Qureshi et al<sup>17</sup>, reported effects of examination stress on blood pressure, these findings were similar to the findings of the present study. However, educational atmosphere of the PUMHSW as well as geographical settings were totally different in these studies. Munir et al.<sup>18</sup> also showed an increase in pulse rate, breath rate, systolic and diastolic blood pressure in

undergraduate medical students when exposed to exam stress. These findings are consistent with a number of studies who showed significant raised levels in pulse rate and blood pressure in students before and during examination stress.<sup>18-</sup> **Systolic Blood Pressure and examination stress:** During the exam time, systolic blood pressure was significantly higher than after the exam. This may be explained by the stimulation of the adrenergic nervous system leading to the release of catecholamine, in particular nor-adrenaline at the post-synaptic neuron, and adrenaline or epinephrine from the adrenal medulla, resulting in the activation of the receptors  $\alpha_1$ ,  $\beta_1$  and  $\beta_2$  resulting in a rise in systolic blood pressure.<sup>21</sup> Diastolic blood pressure is known to be the minimum ventricular diastole pressure and its normal range in adults is 60-90mmHg, with an average of 80mmHg. After the student completes her test, the drop in systolic blood pressure can be clarified that the decrease results from a reduction in peripheral arteriolar resistance and or cardiac output by a variety of mechanisms at a variety of sites such as: dilatation of resistance vessels, lower resistance pumping of the heart. Capacitance vessel dilatation, reduction of venous return to the heart in order to minimize cardiac output. Reduction of sympathetic drive to the heart, especially in response to stress, leads to lower cardiac output.<sup>21</sup>

A significant increase in heart rate during the test ( $P = < 0.0001$ ) was observed in the current study. A significant increase in both systolic blood pressure and pulse rate was observed as a potential consequence of sympathetic activation prior to the examination. This is in line with the reports of Freychuss et al and Malathi et al, who contributed to elevated levels of epinephrine.<sup>22, 23</sup> **Conclusion:** This study concluded that medical student are under tremendous stress during their examination. The examination stress is significantly associated with increased pulse rate, systolic and diastolic arterial pressure.

**ETHICS APPROVAL:** The ERC gave ethical review approval **CONSENT TO PARTICIPATE:** written and verbal consent was taken from subjects and next of kin. **FUNDING:** The work was not financially supported by any organization. The entire expense was taken by the authors. **ACKNOWLEDGEMENTS:** We would like to thank the all contributors and staff and other persons for providing useful information. **AUTHORS' CONTRIBUTIONS:** All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public responsibility of this manuscript. All authors read and approved the final manuscript. **CONFLICT OF INTEREST:** No competing interest declared.

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