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Effect of Pre- Examination Stress on Pulse Rate and Blood Pressure of First Year Undergraduate Medical Students.

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Abstract: *Pre-examination stress is common among the students and is quite predominant among medical students. Among them,the 1st year medical students face a major stress especially during the first M.B.B.S examination. Our study aims at investigating the effect of pre-examination stress on blood pressure and pulse rate of 1st MBBS students to find out how much the students cope up with the stress which in the long run can affect their lifestyle, habits and risk of developing hypertension and other related co-morbidities. Ninety one 1st year students of Jorhat Medical College participated in the study. The arterial blood pressure (indirect method) and pulse rate were measured three months prior to examination and again one week before examination. Statistical analysis was done using QUICKCALs software version 2.0. Student's t- test was used to compare the data and p value < 0.05 was considered significant. Out of the 49 participant male students, the Mean Pulse Rate increased from 78.21±7.85 to 93.65±8.4(p value <0.0001)), Mean SBP from 112±10.97 to 119.63±17.07(p value+0.0079) and Mean DBP from 75.48±9.007 to 84.61±9.21(p value <0.0001)respectively during no examination state and Pre Examination periods. Out of 42 female students, the Mean Pulse Rate rose from 79.73±5.53 to 95.35±7.59 (p value <0.0001),Mean SBP from 109.43±11.31 to 118.87±12.46(p value 0.0008) and mean DBP from 75.53 ±9.51 to 81.94±9.83(p value 0.0003) respectively during no examination state and Pre Examination periods. This study found that majority of the students were under stress prior to examination. There occurs increase in sympathetic activity in students before examination consequent to the psychological stress faced by them. Students can be recommended relaxation techniques like meditation, yoga and counseling sessions to overcome stress.*

Key-words: *Pre Examination Stress, Medical Students, Pulse rate, Systolic blood pressure, Diastolic blood pressure.*

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I. Introduction

Exam anxiety is the emotional reaction that some students face before exams. The fear is not irrational, but excessive fear interferes with performance.The curriculum studied by the medical students is vast and time in which they have to complete their studies is short, therefore medical students are thought to be under stress, especially before their examinations.

There are many possible stressors to which medical students may be exposed like pressure of a meticulous academic curriculum coupled with recurrent examination and other sources of stress include personal factors such as staying away from family, tuning to unfavorable hostel conditions, parental expectations.[1]

Numerous studies have proved that compared to the general population medical students are the most distressed .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.[2] Physiological studies have also shown that stress can affect the vital parameters. These include increase in pulse rate (PR) and Blood pressure (BP).[3]Physiological studies have

shown that stress from any source can influence on the endocrine, haemopoietic and immune systems[4] (2001).Psychological stress increases the activity of hypothalamic-pituitary-adrenocortical (HPA) axis leading to increase circulating levels of glucocorticoids [5] (2003), [6](2002).Hypothalamic-pituitary adrenocortical (HPA)axis that includes sympathetic activation leading to changes in heart rate, blood pressure, rate and depth of respiration, body temperature, reaction time.

II. Materials & Methods

The present study was done in Dept. of Physiology,Jorhat Medical College.Study Population included 1st year undergraduate students of Jorhat Medical College.It was a Hospital based Cross-Sectional Study. Materials used were Mercury Sphygmomanometer, Stethoscope,Stop watch for Pulse Rate measurement.The study was conducted from Feb 2019- Aug 2019.Ethical clearance was obtained from Institutional Ethics Committee(H),JMCH, Jorhat.

Inclusion Criteria were those students who gave consent & were available during the study.The study excluded those students who gave history of hypertension & Mental or family stress or coming from a Psychiatric Background. 3 months prior to University Exams, Blood Pressure and Pulse rate were recorded in sitting position.Pulse was counted for 1 minute and expressed in beats/ minute.Arterial blood pressure was recorded over the right brachial artery, applying a cuff just above cubital fossa, using a mercury sphygmomanometer kept at level of subjects' heart in sitting position. Systolic blood pressure was recorded by palpatory method and then systolic and diastolic blood pressure were recorded by auscultatory method.Then 1 week before University Exams, Pulse Rate & Blood Pressure were again recorded & compared with previous values. Considering percent of exposure with outcome as 26% [7], sample size is calculated as 94 using Open-EPI Software under 95% confidence interval and 80% power. Some students did not take part.Leaving them, sample size came to be 91.The datas were entered into the computer catalogue. The response frequencies were calculated and analysed by using statistical software QUICKCALs software version 2.0.Student's Unpaired t- test was used to compare data and p value < 0.05 was considered significant. P<0.001 was considered as highly significant.

III. Results

FIGURE 1: DISTRIBUTION OF STUDENTS ACCORDING TO SEX.

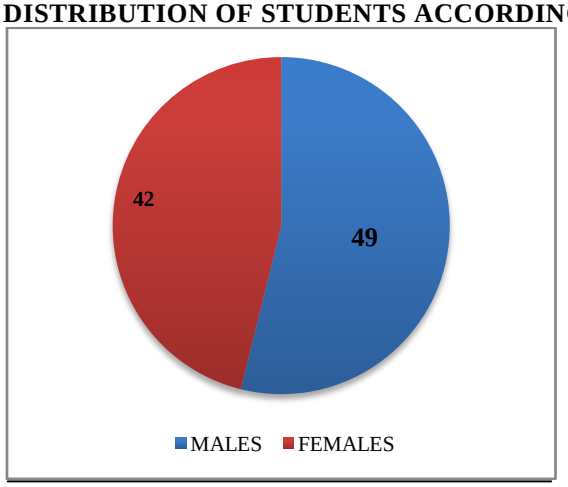


TABLE: PULSE RATE, SYSTOLIC BLOOD PRESSURE(SBP),DIASTOLIC BLOOD PRESSURE(DBP) & RECORDS IN MALE STUDENTS(n=49)

PARAMETERS (MEAN±SD)	NO EXAM	PRE-EXAM	P VALUE
PULSE RATE	78.10±7.83	93.67±8.44	<0.0001
SBP	112±10.97	119.63±17.07	=0.0079
DBP	75.48±9.007	84.61±9.21	<0.0001

TABLE: PULSE RATE, SYSTOLIC BLOOD PRESSURE(SBP),DIASTOLIC BLOOD PRESSURE(DBP) &RECORDS IN FEMALE STUDENTS(n=42)

PARAMETERS (MEAN±SD)	NO EXAM	PRE-EXAM	P VALUE
PULSE RATE	79.73± 5.53	95.35± 7.59	<0.0001
SBP	109.43± 11.31	118.87± 12.46	=0.0008
DBP	73.53± 9.51	81.94± 9.83	= 0.0003

FIGURE 2 :MEAN PULSE RATE INCREASE IN TOTAL STUDENTS(n=91)

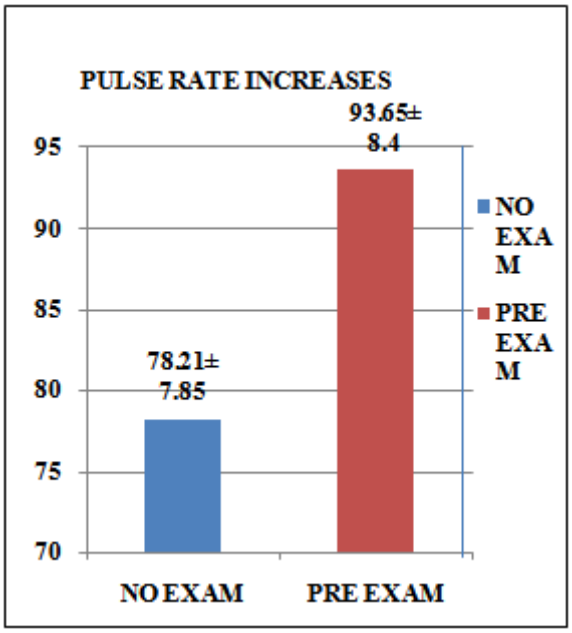
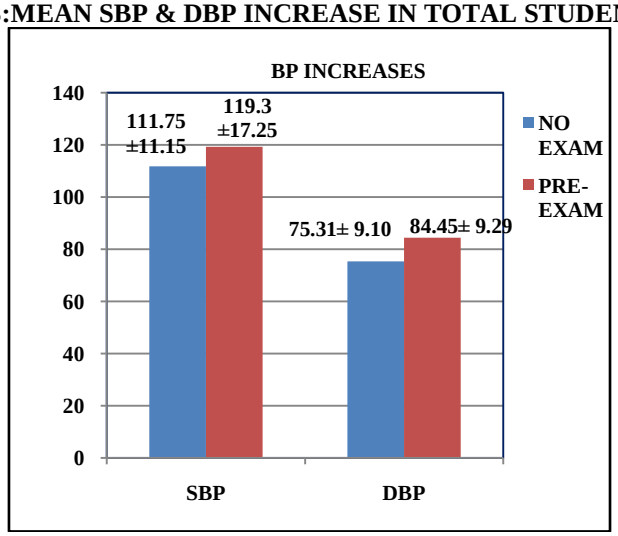


FIGURE 3:MEAN SBP & DBP INCREASE IN TOTAL STUDENTS(n=91)



In our study, there were 49 Male students & 42 Female Students.The Mean Pulse Rate of all students when there was no exam was 78.21±7.85 which changed to 93.65±8.4 during exam . This was highly significany (p value<0.0001). Mean SBP of 91 students increased from 111.75±11.15 to 119.30±17.25 (p value= 0.0006)& DBP from 75.31± 9.10 to 84.45±9.29 (p value <0.0001)during pre-exam period that was highly significant. Individually, out of 49 male students who participated in the study, the Mean Pulse Rate showed a Massive Rise from 78.10±7.83 during No Exam state to 93.67±8.44 prior to the Exam (p value <0.0001). .While the Mean SBP & DBP increased from 112±10.97 & 75.48±9.007 respectively during No Exam to 119.63±17.07 & 84.61±9.21 during Pre Exam times. The change in SBP among the boys came to be less signicant (p value+0.0079) as compared to DBP(Pvalue<0.0001). Among the 42 female students, the Mean Pulse Rate again showed the maximum rise from 79.73±5.53 during No Exam to 95.35±7.59 during Exam state. Which was statistically highly significant(p value<0.0001). The Mean SBP & DBP also rose from 109.43±11.31 & 73.53 ±9.51 respectively during NO Exam to 118.87±12.46 & 81.94±9.83 prior to the Exam times. However, among the Females,the change in SBP & DBP were of lesser significance (p value of SBP & DBP being 0.0008 0.0003 respectively) as compared to their corresponding change in Pulse rate (p value <0.0001)

IV. Discussion

Medical education renders significant amount of stress to the students.[9] Many aspects of college life have the potential to cause stress, including adjusting to a new environment, fulfilling academic requirements, financial pressures, developing friendships, coping up with the syllabus. Examination anxiety is one of the fundamental problems that students face which cause negative effect on their academic performance.

In our study we found that,the pulse rate, systolic & diastolic blood pressure was significantly higher in the pre-examination period than the record when there was no exam. Increase in PR, SBP, occurs possibly as a result of sympathetic activation.This is consistent with the findings of Freychuss *et al* & Malathi *et al* who contributed it to increased epinephrine levels[4,10].The systolic blood pressure was significantly higher in the pre-examination period than the record when there was no exam. 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 α1,β1 and β2 receptors consequently elevation of systolic blood pressure.[19,20].

However, Verbuegge LM. Study on Gender and health:1985 found that examination related anxiety is not significant.[8].Whereas,De Oliveira,Kenia Ferreira Rosa et al 2018 study showed significant rise in SBP & Pulse Rate during exam period but not DBP.[9]

The diastolic blood pressure is the minimum pressure during the ventricular diastole and its normal range is 60-90mmHg in adults. The rise in DBP during the pre-examination period and the period when there was no exam was also found to be significant. The present study observed a significant increase in pulse rate near the examination (P= <0.0001). in case of both males & females.The significant increase in both systolic blood pressure and pulse rate observed prior to exam possibly as a result of sympathetic activation.

Bazmi Inam [11] has noted prevalence of increase anxiety in females to be 89.7% and males 60% in 1st year medical students of Saudi Arabia. Similar findings were noted from other studies conducted at western medical school as well as other Asian and African medical schools using different screening tools.[12] While some studies have found little or no evidence of stress among medical students.[13]

All this may be due to their association with an unhealthy life style such as sedentarism, that leads to the onset of homeostatic imbalance, susceptibility to cardiovascular diseases. Physiologically a correlation has been verified between cardiovascular reactivity and vagal suppression as a consequence of prolonged activation of the sympathetic system by stress [14].

Exacerbation of the sympathetic function related to renal and vascular abnormalities acts directly as a risk factor not only for SAH, but also for other cardiovascular diseases. Correlation has also been found between exacerbated vasoconstriction stimuli with imbalance of the immune response, proving greater susceptibility of persons affected by stress[15].

Epinephrine secretion is increased in presence of stressor like exam where the outcome is unpredictable. This sympathoadrenal response to stressful situation occurs in various forms including raised PR & BP.Other researchers also reported a similar trend of increasing pulse rate, blood pressure, and galvanic skin resistance during examination stress.[16]

Psychological stress associates predisposing factors such as modern life events, problems related to work and family, social isolation, financial problems and violence.These conditions converge directly on psychological anguish in medical students,because they develop poor academic performance, increase rate of drop-out from medical schools, break-down of personal relationships, abuse of toxic substances and suicide.[17]

Eva et al. recorded 64% in their study about the prevalence of stress in medical students. These data converge on the eminent increase in the participation of women in contemporary medicine which, according to the Association of American Medical Colleges, evolved from 31.4% in 1982 to 47% in 2012 and has increased every year.When compared with students of the same age, students of medicine have higher rates of symptomatology of stress: a quarter of them presented substantial symptoms [18].

V. Conclusion

Anxiety due to academic examinations has often been used in stress research because they are predictable, standardized and discrete examples of real-life stress that induce a significant neurohormonal change.But in this era of ever changing curriculum & syllabus for the students,this study gives us the idea how the students are coping with this new pattern at present.This study has found that majority of undergraduate students experience stress during their first credit examination. Both academic and emotional factors are responsible for this stress.

Students can be recommended relaxation techniques like meditation, yoga, breathing exercises, appropriate diet and physical exercises. Counseling sessions could be provided to overcome stress. Support system for the students should be taken in every possible way.English teaching should be given to students weaker in English.& those intended to take professional course should study in English.

The medical students and teaching faculty should be made aware of the negative consequences of stress faced and an effective stress relaxation program as well as counselling services should be provided to such stressed students to enhance their academic performance. Government education system needs to develop good study evaluation techniques which cause less stress among students and teachers, and imply better support programmes for students struggling for their well being. Lastly,our study did not include rate and depth of respiration, body temperature, reaction time, galvanic skin resistance etc which gives further scope to study the effect of Exam stress on all these factors.

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