



**International Journal of Biology, Pharmacy
and Allied Sciences (IJBPAS)**

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

**IMPACT OF UNIVERSITY PRACTICAL EXAM STRESS ON PHYSIOLOGICAL
PARAMETERS AMONG FIRST YEAR MEDICAL STUDENTS**

LATHA S¹, VIJAYAKUMAR R^{2*} AND SRIKUMAR³

1: Associate professor, Department of Physiology, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry, India

2: Professor, Department of Physiology, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry, India

3: Research Associate, Centre of Research, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry, India

***Corresponding Author: Dr. Vijaykumar R: E Mail: sivanviji@gmail.com**

Received 20th Oct. 2020; Revised 19th Nov. 2020; Accepted 15th Dec. 2020; Available online 1st Jan. 2021

<https://doi.org/10.31032/IJBPAS/2021/10.1.1024>

ABSTRACT

Background: Stress is a most common problem faced by all the students. Most of the medical students are experiencing major stress during first year university practical exams. **Aim:** This study was carryout to evaluate the effect of examination stress on vital parameters among first year medical students. **Materials & methods:** 124 first year medical students, which include 58 female and 66 male students, were participated. The university examination stress on the vital parameters such as blood pressure, pulse rate, respiratory rate, temperature and blood glucose level were assessed three months before and immediately at the end of practical examination. The level of stress was also assessed by using SAS (stress anxiety scale) survey in both genders. **Results & Conclusion:** The result showed that there was a significant rise in systolic blood pressure, pulse rate, respiratory rate and temperature ($p < 0.001$) in both male and female students, the diastolic blood pressure was raised significantly only in female students and no significant difference were observed in male students. The blood glucose level was significantly increased in both genders at the time of practical exam. The result of the SAS survey showed that the percentage of stress was more in female students

than male students. This study concluded that periodic counseling before each exam and regular stress reducing exercises like yoga practices and meditation are required to reduce the stress of the students.

Keywords: DASS, Blood pressure, Heart rate, Respiratory rate

INTRODUCTION

Stress is a kind of unpleasant sensation that evoked by several stimuli that persist in the form of any demand, challenge or warning from the environment. Mild stress or Eustress is favorable and it drives the people to learn and adopt the situation without causing any damage to the body [1]. On the other hand, the moderate & severe stress also called distress affects the body function significantly. This may cause physiological and psychological changes in the body [2, 3]. Any agents or the situation that causes the stress is called stressors. The educational system in our society is a common stressor that keeps the students in a continuous stress in both school and at college level. In the higher studies the level of stress was significantly more in professional course students than nonprofessional [4]. Medical curriculum is considered to be one of the important stressors among the medical students [5]. It is quite perceivable that the first-year medical students are under compulsion to get through the entire subject in the university exam to move in to successive year. This makes them to get more stress during university exam. As a result, it leads

to psychic disorder in the form of depression or anxiety [6]. Many research studies showed that the Anxiety and depression is a strong predictor of the academic performance in the healthcare professionals [7, 8]. Some studies evidenced that the academic examinations are more stressful that causes alteration in vital parameters and blood cell count [9, 10]. Though several studies are conducted to show the effect of exam stress, not much studies are available to distinguish the influence of the exam stress in male and female medical students. Hence the present study was designed to evaluate the impact of university exam stress on physiological parameters among the first-year male and female medical students.

MATERIALS AND METHODS

This cross-sectional study was conducted at Sri Lakshmi Narayana institute of medical sciences, Pondicherry. After getting institutional ethics permission (No.IEC/C-P/28/2018) and students consent, 124 healthy students were participated in this study. Out of which 66 were male and 58 were female students. They were aged between 18-19 years. The

blood pressure, heart rate, respiratory rate and temperature and blood glucose level was measured three months before and immediately at the end of practical exam. The systolic and diastolic blood pressure was measured by using sphygmomanometer. The pulse rate was counted by palpating the radial artery and the respiratory rate was counted by observing the chest movement for complete one minute [11]. The temperature was recorded by placing digital thermometer in the armpit. The blood glucose was measured by using Glucometer. Capillary blood from tip of finger was used for blood glucose analysis. The level of the stress and anxiety was measured one day before the practical exam by using self-prepared questionnaires called SAS (stress anxiety scale) scoring [12]. It consists of 42 questions and the rating given for the score

in such a way that, no stress is 0, mild stress is from 1-42, moderate stress is from 43-84 and severe stress is more than 84. The students were asked to fill the self-structured SAS format to assess the level of stress.

Statistical Analysis

The data were subjected to one-way analysis of variance (ANOVA) followed by tukeys multiple comparison test (IBM SPSS statistics 20). The results were expressed as mean \pm SD and the fixed p value of $P < 0.005$, $P < 0.001$ were considered statistically significant.

In the SAS analysis, Data entry and statistics were performed using the Microsoft Excel and results were expressed in percentages.

Table 1: The vital parameters 3 months before the examination in both boys and girls

Gender	No. of students N	Blood pressure		Pulse rate	Respiratory rate	Temperature	Blood glucose
		Systole	Diastole				
Boys	66	117.4 \pm 10.1	71.09 \pm 8.2	82 \pm 10.9	15.6 \pm 1.6	98. \pm 0.3	91.5 \pm 9.1
Girls	58	104 \pm 11.1	65.3 \pm 8.2	89 \pm 9.6	13.9 \pm 2.02	98.1 \pm 0.42	81.03 \pm 8.2

The results were expressed mean \pm SD

Table 2: Effect of exam stress on the day of practical exam in both boys and girls

Gender	No. of students N	Blood pressure		Pulse rate	Respiratory rate	Temperature	Blood glucose
		Systole	Diastole				
Boys	66	124 \pm 12.4**	73 \pm 9.5	89.5 \pm 13.05**	23.6 \pm 5.04**	99.73 \pm 0.4**	97.71 \pm 9.46**
Girls	58	112.3 \pm 13.5**	71.6 \pm 10.4**	97.33 \pm 12.3**	23.21 \pm 5**	99.77 \pm 0.54**	92.79 \pm 7.8**

The results were expressed Mean \pm SD. ** represents statistical significance compared with before exam at $P < 0.001$, * represents statistical significance compared with before exam at $P < 0.005$

Table 3: SAS scoring one day before the practical exam in both boys and girls

Gender	No. of students (N)	percentage of students without stress	Percentage of students with mild stress	Percentage of students with Moderate stress	Percentage of students with Severe stress
Boys	66	nil	59%	41%	nil
Girls	58	nil	30%	57%	13%

DISCUSSION

Summary of Findings

The result shows that, the systolic blood pressure, heart rate, respiratory rate, temperature and blood glucose level were significantly ($p < 0.05$, $p < 0.001$) raised and no significant rise in diastolic blood pressure was observed in boys immediately after exam when compared to the before exam. On the other hand, the result of the girls showed that the significant increase in all the vital parameter such as systolic, diastolic blood pressure, respiratory rate heart rate and temperature and blood glucose level after exam when compared to before exam. The DASS survey results were expressed in percentage showed that all the students are in some stress. The percentage of mild stress was more in boys (59%) when compared to percentage of moderate stress (41%). Result also showed that none of the boys were under severe stress. But in females the percentage of moderate stress (57%) was more when compared to percentage of mild stress (30%). Some percentage of girls were under severe stress (13%).

The knowledge of the subjects was assessed by conducting the examination is an usual procedure that every student must confront in their academic duration. Present examination systems are likely to induce stress both physically and mentally in the

body. During stress Hypothalamic-Pituitary -Adrenal (HPA) axis and sympathetic system are activated. When sympathetic system is activated that causes vasoconstriction, and tachycardia. Because of this, the cardiac output and peripheral resistance increase, that increases both systolic as well as diastolic blood pressure [13-14]. This concept was experimentally proved in animal studies that the psychic stress stimulates sympathetic system that increases heart rate and blood pressure [15]. The result of the present study also shown that there was significant increase in systolic blood pressure and pulse rate, in both male and female students. The diastolic blood pressure was increased significantly only in girls and no significant changes were observed in boys. This reveals the truth that females have high negative impact of stress during exam than boys. No changes were observed in the DBP in boys probably the fact that the boys are always involving in more physical activity than girls. Perhaps the increased physical activity causes vasodilatation that compensates the vasoconstrictor effect caused by sympathetic stimulation during exam stress. This study also showed that the body temperature and respiratory rate was increased at the time of exam. The examination stress is a kind of psychological stress that causes mild grade

fever [16]. The exact mechanism behind this is not known. The increased body temperature in turn increases the respiratory rate. This was supported by the findings of earlier studies done by the Haldane (1905), Bazett, H. C. and Haldane, J. They mentioned in their study that the increase in temperature at rest increases the pulmonary ventilation and respiratory rate [17, 18]. Apart from this, the results of present study also showed the raised level of blood glucose in both genders. The activation of HPA axis during stress enhances the blood cortisol level that stimulate Gluconeogenesis which increases the blood glucose level [19]. The DASS scoring of this study indicate that the level of distress was more in female students when compared to male students. This was supported by the result of the previous studies done by Babar T.S *et al* (2004) and Mohsin S. *et al* (2010) [20, 21].

CONCLUSION

The university examination stress is unpreventable stressor for medical students that cause changes in the vital parameters. The Changes might be a compensatory response of the body to the exam stress. Stress level was more in female students compared to male students. From this study it was well understood that the incidence of stress is high among medical students that not only affect the academic performance

but also it affects the health to considerable amount. This study suggested that regular periodic counseling and stress reducing exercises are required for the students to reduce their stress and to increase confidence in their academic performance.

Strength and Limitation of this Study

In this study the impact of stress on vital parameters and the level of stress in both male and female first year medical students given separately. Presently not much research articles available to show this difference in first year medical students. This is the main strength of this study. However, the major limitation is not mentioning the cortisol level in this study since the blood cortisol is the important marker of the stress.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

Sources of funding:

Self

Authors contribution:

Latha, Vijayakumar – Contributed together in the development of methodology, Research work, Result and discussion writing, work of statistical analysis, Research work, formatting the article and Review the article

Declaration of Conflict of interest

No conflict of interest

REFERENCES

- [1] Kaplan HI, Sadock BJ. Learning Theory: Synopsis of psychiatry: Behavioral Sciences/ Clinical Psychiatry. Philadelphia, PA: Lippincott Williams and Wilkins; 2002.
- [2] Elliot AJ, Shell MM, Henry KB, Maier MA. Achievement goals, performance contingencies, and performance attainment: an experimental test. *J Educ Psychol.* 2005; 97(4): 630–640.
- [3] Trautwein U, Lüdtke O, Marsh HW, Köller O, Baumert J. Tracking, grading, and student motivation: using group composition and status to predict self-concept and interest in ninth-grade mathematics. *J Educ Psychol.* 2002; 98(4): 788–806.
- [4] Singh A. and Singh S. Stress and adjustment among professional and non-professional students. *Industrial Psychiatry Journal* 2008. 17 (1), 26-27.
- [5] Reem Rachel A. (2009): A report on stress among first year students in an Indian medical school. *South East Asian Journal of Medical Education* Vol. 3 no. 2, 2009, 78-81.
- [6] Kozicz T, Bordewin LA, Czéh B, Fuchs E, Roubos EW. (2008). Chronic psychosocial stress affects corticotropin-releasing factor in the paraventricular nucleus and central extended amygdala as well as urocortin 1 in the non-preganglionic Edinger-Westphal nucleus of the tree shrew. *Psychoneuroendocrinology*, 33(6): 741-754.
- [7] Schutz CM, Dalton L, Tepe RE. Learning and Study Strategies Inventory subtests and factors as predictors of National Board of Chiropractic Examiners Part 1 examination performance. *J Chiropr Educ.* 2013; 27:5–10.
- [8] Kinsinger S, Puhl AA, Reinhart CJ. Depressive symptoms in chiropractic students: a 3-year study. *J Chiropr Educ.* 2011; 25: 142–150.
- [9] Sharma B, Wavare R, Deshpande A, Nigam R, Chandorkar R. A study of academic stress and its effect on vital parameters in final year medical students at SAIMS Medical College, Indore, Madhya Pradesh. 2011.
- [10] Maes M. *et al* (1998): Influence of academic stress on hematological measurements in subjectively healthy volunteers. *Psychiatry Res* 1998; 80: pp-201-212.
- [11] Thakur D, Oomen ER. Effect of examination stress on physiological & psychological parameters among undergraduate medical students.
- [12] Singh R, Goyal M, Tiwari S, Ghildiyal A, Nattu SM, Das S. Effect of examination stress on mood,

- performance and cortisol levels in medical students. *Indian J Physiol Pharmacol.* 2012; 56(1): 48-55.
- [13] Rahn KH, Barenbrock M, Hausberg M. The sympathetic nervous system in the pathogenesis of hypertension. *J Hypertens.* 1999; 17(suppl): S11–S14.
- [14] Oparil S, Zaman MA, Calhoun DA. Pathogenesis of hypertension. *Ann Intern Med.* 2003; 139:761–776.
- [15] Malliani A, Pagani M, Lombardi F, Furlan R, Guzzetti S, Cerutti S. Spectral analysis to assess increased sympathetic tone in arterial hypertension. *Hypertension.* 1991; 17(suppl 4): III36–42.
- [16] Oka T, Kanemitsu Y, Sudo N, Hayashi H, Oka K. Psychological stress contributed to the development of low-grade fever in a patient with chronic fatigue syndrome: a case report. *Biopsychosoc Med* 2013; 7: 7;
- [17] Haldane, J. S. (1905). "The influence of high air temperatures. No. I", *J. Hyg. Camb.* 5, 494-513.
- [18] Bazett, h. C. And haldane, J. B. S. (1921). "Some effects of hot baths on man", *J. Physiol.* 55, 4-5 p.
- [19] Khani S, TAYEK JA. Cortisol increases gluconeogenesis in humans: its role in the metabolic syndrome. *Clinical Science.* 2001 Dec 1; 101(6): 739-47.
- [20] Babar T. S. *et al* (2004): Students, Stress and Coping Strategies: A Case of Pakistani Medical School. *Education for Health*, Vol. 17, No. 3, November 2004, 346 – 353.
- [21] Mohsin S. *et al* (2010): Perceived Stress, Sources and the Severity of Stress among medical undergraduates in a Pakistani Medical School. *BMC Medical Education* 2010, 10.