

STUDY OF EFFECT OF PREEXAMINATION STRESS ON CARDIOVASCULAR AUTONOMIC FUNCTION OF FIRST YEAR MEDICAL STUDENTS

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ABSTRACT

Introduction : Medical students are frequently described as stressed in comparison with general population. Particularly examinations are a major cause of stress. High level of stress may have adverse effect on academic achievement. The medical students are more stressful, effects of stress, student's adaptation styles, and intervention measures to deal with stress, as it is believed that healthy medical students are likely to become healthy doctors who can then be model and promote healthy lifestyles with their patients.

Methods : MATERIALS AND METHOD- Present study was conducted in the department of Physiology, Jorhat Medical College, Assam on medical students one month before and one month after the completion of the first trimester examination, to determine the effects of examination stress on cardiovascular autonomic function which affect academic performance STUDY DESIGN : Institution based Cross Sectional Study. STUDY SITE:- Department of Physiology, Jorhat Medical College & Hospital, Jorhat, Assam STUDY POPULATION:- 100 First year Medical Students of Jorhat Medical College INCLUSION CRITERIA The healthy students were chosen from the age group of 18 to 20years EXCLUSION CRITERIA- The students who were having history of any other major illness viz: hypertension, diabetes mellitus, heart disease etc. The students who had history of Smoking, tobacco chewing. Systemic diseases were ruled out in the selected students by taking their detailed history and by their thorough clinical examination The following autonomic function test was carried out PARASYMPATHETIC TEST 1 Standing to lying ratio 2.Valsalva Ratio SYMPATHETIC TEST 1.Hand Grip test 2.Orthostatic hypotension test:

Results :The study revealed that, 1. The group with elevated anxiety was associated with increased abnormal autonomic functions. Hand grip test showed significant difference p value $<.05$ during pre-examination in comparison to post examination period Valsalva ratio was less in students during pre examination period compared to post examination

Conclusion :The examinations in first year medical students, affects the functioning of autonomic nervous system. Continued follow up of this cohort can provide information regarding changing response to stress and can help medical teachers understand more about stress among their students and guide them to improve in academic context which is

Key word –Autonomic Sympathetic Parasympathetic Stress

INTRODUCTION

The stress system is essential for individual and species survival. Normal stress system function is crucial for maintenance of mental and physical health. Dysregulation of stress system entails pathophysiology. The human body reacts to stress by activating a complex repertoire of behavioral and physiologic responses.¹ Stress is produced when stressor interacts with individual's appraisal of it to induce emotional behavioral and physiological reaction's. Stress can be defined as the body's reaction to a change that requires physical, mental, and emotional harmony or reaction (1). While mild stress levels have beneficial effects on cognitive performance, constantly high levels of stress exposure can lead to anxiety and depression (2). The main components of the stress system are corticotropin-releasing hormone (CRH) and locus coeruleus-norepinephrine-autonomic systems, as well as their environmental effectors (3). As a result of the activation of the stress system, physiological and behavioral changes are seen in the body. The neuroendocrine response, which covers a range of coordinated responses, is provided by the autonomic nervous system and Hypothalamus-Pituitary Gland-Adrenal (HPA) axis. The basic endocrine response, which occurs in the state of stress, begins with the release of CRH from the hypothalamus. CRH causes the release of adrenocorticotrophic hormone (ACTH) from the anterior pituitary, and ACTH affects the adrenal cortex, causing glucocorticoid release. In short, stressors trigger the activation of the autonomic nervous system and HPA axis through mechanisms involving the hypothalamus and brainstem. Thus, the HPA axis activates the sympathetic system, leading to changes in pulse rate, blood

pressure, respiratory rate and depth, reaction time, and body temperature (4,5). Literature has reported an increase in the level of stress during medical training. It has been reported that they show depression.[4,5] and even suicide thoughts.[6,7] among medical undergraduates. Academic stresses in the form of assessment, formative as well as summative, are the most common cause for the occurrence of systemic pathologies such as autonomic, cardiovascular, and immune among the medical college students.[4,5] These all lead to mental and physical illness such as nervousness, mood changes, and menstrual disturbances in female students.[8] Competitive environments, ambition for higher achievements, family and peer pressure also do increase the extent of stress in the life of a medical student.[9]

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Autonomic function test is done by using

1.ECG machine

2.Spygmomanometer

3.Handgrip dyanometer

PROCEDURE OF AUTONOMIC FUNCTION TEST EVALUATION:

1. DEEP BREATHING TEST: In the sitting position subject was asked to breathe quietly and deeply at the rate of 6 breaths per minutes. A continuous ECG was recorded for six cycles, with marker to indicate the onset of each inspiration and expiration R-R interval were measured during each breathing cycle and converted to beats per minutes. The result was then expressed as mean of the difference between maximum and minimum heart rate for six measured cycles in beats per minutes Deep Breathing Difference (DBD) = mean of heart rate difference on 6 breath cycle. A normal response was a difference of 15 beat/min or more, 11-14 beats/min borderline and less than 10 beat/minutes was considered abnormal.

2. HEART RATE VARIATION TO VALSALVA MANEUVER: The subject was seated comfortably and was asked to blow into a mouth piece attached to mercury sphygmomanometer and holding it at pressure of 40mmHg for 15 seconds while a continuous ECG was being recorded. The ECG was continued to be recorded after release of pressure at the end of 15 seconds for 30 seconds the heart rate changes induced by valsalva manoeuvre was expressed as the rates of the maximal tachycardia during the maneuver to the maximal bradycardia after the manoeuvre. This rate was defined as valsalva ratio and was calculated as ratio of maximum R-R interval during the maneuver to minimum R-R interval after the maneuver.

Valsalva ratio (VR) = Maximal tachycardia/maximum bradycardia = maximum R-R interval/minimum R-R interval

A value of 1.10 or less is defined as an abnormal response, 1.11-1.20 as borderline and 1.21 or more as a normal response.

3. HEART RATE RESPONSE TO STANDING-POSTURAL TACHYCARDIA INDEX (PTI): The subjects were asked to lie on the examination table quietly while heart rate is being recorded on ECG. They were then asked to stand up unaided and ECG was recorded for 1 min. The shortest R-R interval at or around 15th beat and longest R-R interval at or around 30th beat was measured. The result was expressed as ratio of 30/15.

PTI = Longest R-R interval at 30th beat/Shortest R-R interval at 15th beat

A ratio of 1.00 or less was defined as an abnormal response, 1.01-1.03 as borderline and 1.04 as normal response.

4. BP RESPONSE TO STANDING (ORTHOSTATIC TEST): The subject was asked to rest in a supine position for 5 minutes. The resting BP will be recorded. The subject was then asked to stand unaided and remain standing unsupported for 3 minutes. The BP was recorded at 30 seconds and 3 minutes after standing up. The difference between the resting and stand by BP level will be calculated. The fact of 30mmHg or more was defined as abnormal, fall between 11-29 mmHg as borderline and fall of 10mmHg or less was considered normal.

Heart rate response to deep breathing, valsalva maneuver and standing are known as tests to evaluate parasympathetic nervous system pathway, whereas BP response to standing allow the assessment of sympathetic nervous system activity.

OBSERVATIONS: Student's 't' test will be used for analysis of the data.

Results:

Result 1 Showing autonomic function parameters in pre-examination and post examination stress

Autonomic function test	Valsalva test		Deep Breathing test		Orthostatic test		Hand Grip test	
No of Subject=100	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pre examination	1.48	.0709	20.33	6.65	10.00	0.00	18.79	4.19
Post examination	1.43	.087	17.62	4.12	7.03	2.38	21.66	2.08

TABLE 2 Showing autonomic function parameters pre-examination

TEST	PRE	POST	PVALUE	SIGNIFICANCE
Valsalva test	1.48 ±0.0709	1.43±.087	<.05	Significant
Deep breadth test	20.33± 6.65	17.62±4.12	<.05	Significant
Orthostatic test	10.00±0.00	7.03±2.38	.>.05	Not Significant
Hand Grip test	18.79±4.19	21.66±2.08	>.05	Not Significant

studies that describe stress in the form of continuous mental task elevates salivary cortisol significantly and stressed individual reacted with high cortisol¹⁶. Another study found that examination period was associated with significant reduction in cortisol and reduction was associated with enhanced memory. It was also observed that number of students with abnormal AFT increased during examination from baseline, but remained increased during post examination. This is supported by many earlier studies which found elevated cortisol levels in the group with perceived high anxiety scores.

The group that responded with higher cortisol during examination showed better performance. This is supported by the study that found poorer mental health scores possibly associated with lower cortisol scores when salivary cortisol levels were considered. In the present study it was observed that higher the anxiety decreased the examination performance. The negative association between anxiety and performance was observed by the previous study, which noticed that high anxiety scores are likely to impair performance. The results of this study should help understand the pattern of response to the examination stress and enable development of strategies that will assist the students to handle the stress in a more efficient manner. The strategies could be the one, which enable the students to face the

examination or to increase the number of formative tests that will give feedback to the students and guide them to improve deficiencies in learning. In the menstrual stress it was observed that autonomic function test were found abnormal during premenstrual and postmenstrual phase significantly higher heart rate, systolic and diastolic blood pressure in basal condition changes in autonomic function may be responsible for some of the symptoms produced through endorphins and have been held responsible for behavioral change.

Discussion

Stress is a condition that puts mind in a state of fear or anxiety. Stressors can be physical conditions such as heat or inflammation, exercise, etc. or psychological like examination, interview, etc [8] (2006). Pre-examination stress is one of the most widely suffered problems in medical students throughout the world. MBBS students are at more stress as they are exposed to professional course first time in their life with a lot of expectations [9] (2012). The students of 1st year M.B.B.S. probably face a major stress especially during the 1st term credit examination [10] (1992). In our study there was highly significant increase in Valsalva test and significant increase in Deep breadth test in medical students during pre-examination period when compared with these parameters during post examination.

The present study shows the mean value of valsalva test in pre-examination recording (1.48) higher than the mean value of post-examination (1.43] even higher when compared to recording during relaxed state The difference of mean of valsalva test was significant between the values of pre-examination and post-examination recordings ($P < 0.05$), and for relaxed state and pre-examination recording ($P < 0.05$). The difference of mean of Orthostatic test and Hand Grip test was not significant between the values of pre examination and post-examination state ($P > .05$].

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Human body responds to stress by alterations in different biological functions especially autonomic functions like heart rate and blood pressure [17] (1998). Increase in pulse rate and blood pressure is important sympatho-adrenal responses to physiological stressful experience when outcome is unpredictable or in condition of fear, there is an increase in adrenaline secretion[18] (1984).Increased level of plasma epinephrine and nor-epinephrine during stress by their action on beta receptors of heart increases heart rate[19] (1988) and systolic blood pressure[20] (1986),[21] (1998),[22] (2007). Stress act directly or indirectly upon brain stem, a great sympathetic discharge is induced at the spinal cord and terminal endings of the sympathetic nervous system. The release of norepinephrine is the cause of arteriolar vasoconstriction raising peripheral resistance and that increases diastolic blood pressure [23] (1997)

CONCLUSION

Examinations in first year medical students, affects the functioning of autonomic nervous system. Continued follow up of this cohort can provide information regarding changing response to stress and can help medical teachers understand more about stress among their students and guide them to improve in academic context which is important for student achievement.

We can summaries and conclude that there does occur increase in sympathetic activity in students who were to appear in their examination consequent to the psychological stress faced by them. Students can be recommended relaxation techniques like meditation, yoga, breathing exercises, appropriate diet and physical exercises. Counseling sessions could be provided to overcome stress.

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