

ORIGINAL ARTICLE**Assessment of effect of examination stress on cortisol levels**¹Priteshkumar Hariprasad Gandhi, ²Jayanti Singh¹Assistant Professor, Department of Physiology, Santosh Medical College & Hospital, Ghaziabad, Uttar Pradesh, India;²Assistant Professor, Department of Physiology, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh, India**ABSTRACT:**

Background: Stress is a physical or psychological stimulus that can produce mental or physiological reactions that may lead to illness. The present study was conducted to assess the effect of examination stress on cortisol levels. **Materials & Methods:** 110 medical students of both genders were selected. Their salivary cortisol levels were measured using quantitative ELISA, and their mood factors were evaluated using the depression anxiety stress scale (DASS) scoring system. **Results:** Out of 110 patients, males were 60 and females were 50. The mean SBP was 118.4mm Hg and 120.4mm Hg, and DBP was 78.4mm Hg, and 80.6mm Hg. The mean heart rate was 72.4beats/min and 76.8beats/min. The stress level was 12.1 and 15.7, the anxiety level was 9.5 and 12.4, and the depression level was 7.2 and 9.6. The mean cortisol level was 2.72ng/ml and 5.04 in relaxed state and stressed state respectively. The difference was significant ($P < 0.05$). **Conclusion:** In order to improve students' academic performance, medical instructors and students alike should be made aware of the detrimental effects of stress encountered during medical training. These students should also be offered counseling services in addition to an effective relaxation program.

Keywords: anxiety, depression, stress

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INTRODUCTION

A physical or psychological stimulus that can produce mental or physiological reactions that may lead to illness is the definition of stress.¹ While chronically high levels of stress can cause anxiety and depression, which are recognized as distinct neuropsychiatric disease entities, mild levels of stress may be advantageous for cognitive activities and performance. An increase in corticosteroid release is a hallmark of the stress reaction.² This reaction shows significant individual variations. When under stress, some people consistently exhibit significant rises in cortisol, while others exhibit little to none at all. There may be two distinct groups represented by high vs low cortisol responders, with varying levels of perceived stress and personality characteristics.³

Academic exams are seen to be one of the most acute stressors because exam performance typically has an impact on a student's career.⁴ Numerous research has shown that medical training increases psychological distress rates among students. Stressful exam periods cause students' cortisol concentration and excretion rates to rise. This happens as a result of stress, which raises HPA-axis activity and raises salivary cortisol levels. Measurement of salivary cortisol has been seen as a useful and practical substitute for measurement of

plasma cortisol.⁵ In addition to being non-invasive, it is not affected by salivary secretion rate and accurately represents the level of free, physiologically active cortisol in plasma. Additionally, it permits the overdrive of the HP A axis to be demonstrated, which is useful for assessing individuals with stress, anxiety, or depression.^{6,7} The present study was conducted to assess the effect of examination stress on cortisol levels.

MATERIALS & METHODS

The present study consisted of 110 medical students of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender, etc. was recorded. Their salivary cortisol levels were measured using quantitative ELISA, and their mood factors were evaluated using the depression anxiety stress scale (DASS) scoring system. Two mood characteristics were assessed for the subjects: once in a relaxed state (no exams in the two weeks before and following the evaluation), and once in a stressed state (the day of the viva voce examination). Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 110		
Gender	Male	Female
Number	60	50

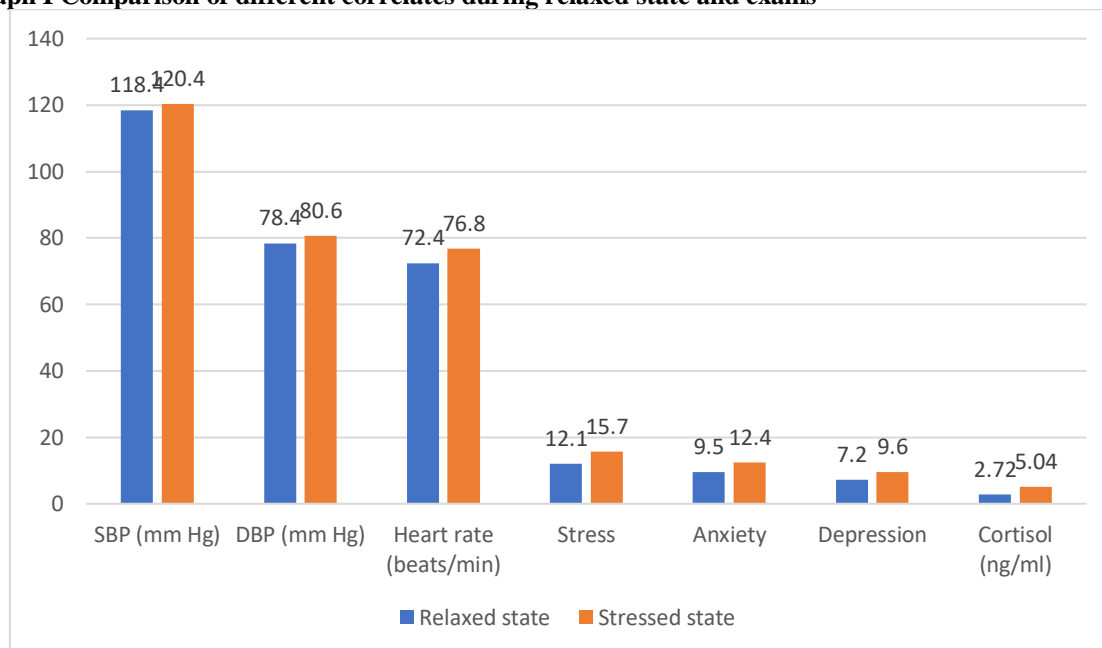
Table I shows that out of 110 patients, males were 60 and females were 50.

Table II Comparison of different correlates during relaxed state and exams

Parameters	Relaxed state	Stressed state	P value
SBP (mm Hg)	118.4	120.4	0.12
DBP (mm Hg)	78.4	80.6	0.64
Heart rate (beats/min)	72.4	76.8	0.71
Stress	12.1	15.7	0.02
Anxiety	9.5	12.4	0.01
Depression	7.2	9.6	0.05
Cortisol (ng/ml)	2.72	5.04	0.01

Table II, graph I shows that the mean SBP was 118.4mm Hg and 120.4mm Hg, DBP was 78.4mm Hg, and 80.6mm Hg. The mean heart rate was 72.4beats/min and 76.8beats/min. The stress level was 12.1 and 15.7, the anxiety level was 9.5 and 12.4, and the depression level was 7.2 and 9.6. The mean cortisol level was 2.72ng/ml and 5.04 in relaxed state and stressed state respectively. The difference was significant ($P < 0.05$).

Graph I Comparison of different correlates during relaxed state and exams



DISCUSSION

Stress is a condition marked by tension, impaired nervous system function, and an imbalance in how the body functions.^{8,9} Stress can be brought on by several different circumstances. When someone is under stress due to an unpleasant experience, they react to it by changing their behavior, perception, and physiological and emotional states. People may experience reactions without even realizing it, even though they may believe that events do not much affect them.^{10,11} The most common causes of stress are unpredictable, unpleasant circumstances and having more work than one can handle. Medical curriculum is stressful and varied levels of stress have been reported amongst medical students and health

care professionals.^{12,13} The present study was conducted to assess the effect of examination stress on cortisol levels.

We found that out of 110 patients, males were 60 and females were 50. Singh et al¹⁴ enrolled 35 medical students. Their mood parameters were assessed, using Depression Anxiety Stress Scale (DASS) scoring. Their study found that the levels of mood parameters and salivary cortisol were significantly raised during examination stress. The changes in stress level significantly correlated with changes in levels of anxiety and salivary cortisol though there was no significant effect on the performance. Males and females showed similar changes in mood parameters.

We found that the mean SBP was 118.4 mm Hg and 120.4 mm Hg, DBP was 78.4 mm Hg, and 80.6 mm Hg. The mean heart rate was 72.4 beats/min and 76.8 beats/min. The stress level was 12.1 and 15.7, the anxiety level was 9.5 and 12.4, and the depression level was 7.2 and 9.6. The mean cortisol level was 2.72 ng/ml and 5.04 in relaxed state and stressed state respectively. Nicolson N et al¹⁵ in their study 56 healthy men and women in three age groups had their salivary-free cortisol levels assessed at home and in response to a speech task in the lab. Older age groups showed higher basal cortisol levels. There was no correlation found between basal levels and gender, recent life stress, or current distress. Age-related differences in cortisol responses to the speech task included the oldest group having the lowest responses. Men showed a strong trend in this area, with the youngest participants exhibiting the longest and greatest reactions. Other analyses did not reveal the impact of age on women's reactivity, even though women over 70 years old were the least likely to respond at all. This could be because anticipatory baseline elevations reduced the subsequent cortisol response. The findings show modest rises in basal cortisol levels, but they contradict the theory that normal aging in humans causes cortisol reactions to stressors to become more intense or prolonged. The limitation of the study is the small sample size.

CONCLUSION

Authors found that in order to improve students' academic performance, medical instructors and students alike should be made aware of the detrimental effects of stress encountered during medical training. These students should also be offered counseling services in addition to an effective relaxation program.

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