

Effect of Examination Stress and its Consequences in Dental Students

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Abstract: Objective: Medical education being very arduous and laborious, students faces enormous stress during the course of education. It gets even worse as the exams progresses, which causes various mental and physiological changes affecting student's health and their academic performances. The aim of the study was to find out the stress level in students by evaluating the salivary cortisol levels before written and oral exam respectively and comparing it with the salivary cortisol level after the exams are completed.

Study design:

Methods: In this study, 100 healthy individuals of first year dental students aged between 17 to 19 years were included. Salivary samples from the students were collected before the written exam and oral exam respectively and were considered to be samples during the stressful period. Likewise samples were collected from the same students a week after the completion of university exams and were considered as samples during their relaxed period. Both the samples, during stressful period and relaxed period were taken for cortisol analysis.

Results:

The cortisol level was found to be significantly increased in stressful period which is before both oral and written exams ($P \leq 0.05^*$) compared to relaxed period which is after

the completion of all the exams. A marked increase in cortisol secretion was found before oral exams (216.41±17.31) in comparison to the cortisol secretion before written exams (119±5.48) which could signify the severity of stress posed by the students before oral exams.

Conclusion: Examination is important and should be faced with a challenging spirit. If not it would affect the students both physically and psychologically causing anxiety and stress and

thereby affecting their performance.

Keywords: Cortisol, Examination, Written and Oral, stress and anxiety.

Introduction:

Education is a process of acquisition of knowledge, skills or values. It is indispensable because it holds ones future prospects, personally and socially. Though education is enlightening, it has become a burden to students, when forced to study. Hence, education has become an inevitable stress by itself, apart from parting knowledge to students. The growing problem all over the world now is stress posed by the student population, than ever. Stress is an uncontrollable, undesirable situation when a person has more workload that they could handle (1). It is rated that India stands highest in suicides between the age group 15 to 29. And this is because of the constant pressure that the students are subjected to, to excel in studies causing anxiety, leading to depression and stress which is also noticed in NEET appearing students nowadays. Stress has become an inevitable factor in student's life especially in medical and dental students where the curriculum is vast. Exams play a vital role as it evaluates their capability. Hence exams are their key concern, which causes more anticipation and stress before taking it up. This increase in stress before exams causes increased level of cortisol secretion which was evaluated by this study.

Materials and method:

This study was conducted with (IEC No. 11/Jan/2019) the permission of human ethical committee. In this study, 100 dental students in the age of 17 to 19, were included voluntarily for the study. Consent forms were taken from all the students. The study was conducted on students before written exams and oral exams respectively and a week after the completion of all the exams.

Cortisol in the saliva was assessed to evaluate the stress level in students. So saliva samples were collected before the written examination (Between 10.30 to 11.00 am). Likewise samples were also collected before the viva examination and both levels were compared to the salivary cortisol level of the students after the completion of their exams.

Analysis of cortisol in saliva:

Saliva samples were collected by using passive droll method as described by Granger et al., (2007). Samples were stored at -20°C. After thawing, they were centrifuged for 10 minutes at 4000 rpm and the supernatants were analyzed with ELISA (Diametrarsl) method. Assay buffer was used to dilute and all samples were assayed in triplicate. Cortisol was diluted using BSA stocks solution (1 mg/ ml) at pH 9.6. 200 microliter /well, was added to a 96 well plate and was incubated overnight at 4°C. The blocking buffer was added and samples

were kept in the incubator for 2 hours at 37°C.

After the washing, diluted primary antibody were added and kept incubated for 45 min at 37°C. Secondary antibody was added 100 µl/ well after the washing and kept incubated for 30 minutes at 37°C. Streptavidin peroxidase solutions were added to the samples and incubated for 4°C for 15 minutes. Then the results were recorded.

Statistical analysis:

Statistical analysis was done using SPSS, version 17.0. The normality of data was tested using Student 'T' test. All the data were expressed as Mean±SD. The pre and post data was analyzed using paired' test. Group comparison was done using one way analysis of variants. $P < 0.05^*$ was considered significant for all the statistical analysis.

Results:

The average age of students participated in the study was calculated as (18.5±1.45). The cortisol levels in saliva of students before and after the oral and written exams with average and standard deviation is given in figure 1. The cortisol level was found to be increased in the case of students before exams compared to the students after exams. The cortisol secretion varied drastically between written exam by 7 times (119±5.48), oral exam by 12 times (216.41±17.31) and was compared with the levels after the exam (17.58±1.35). A significant difference was noted in which the students appearing for the oral exam reported a comparatively higher level of cortisol secretion than the written exam appearing students.

Discussion:

“Adaptation to our surrounding is one of the most important physiological reactions in life; one might even go so far as to say that the capacity of adjustment to external stimuli is the most characteristic feature of life matter” said by “selye”. This study has helped us understand the importance of adaptation and its related consequences if not adapted leading to stress.

Stress is an inevitable factor in this modern world. When a human faces threat, it is either exhibited as eustress or distress. Eustress or good stress motivates a person, to take up the task as a challenge and to achieve their goal. But when stress becomes intolerable or hard to cope-up with, then distress or bad stress manifests. This leads to depression or anxiety affecting one's health.

Stress is omnipresent. It doesn't spare even the students to the extent that academic factors are one of the most important stressor. Students undergo enormous pressure to excel in their academic performances and to prove themselves. Studies around the world have reported higher level of stress in students especially in the medical and dental students.

Medical studies are extensive and difficult that studies have reported, an increased level of stress in students with a prevalence ranging between 27-73% (2). Further reports also show that the stress and anxiety posed is comparatively more only in the first year Medical students. (3) The reason for this increased stress could be a new atmosphere, a different syllabus, a different medium of education for few, difficulty in comprehending the subjects, feeling of incompatibility, enforcement given by parents or teachers to get high marks, lack of prescheduling and time management, anticipation of exams, feeling

helpless and homesick etc. Moreover, adolescent age group could also be a reason for being distracted and not to be focused. Studies have reported that, adolescence to be a period filled with emotional, behavioral and developmental turbulence (4). Hence, Erikson described adolescence to be holding a special feature called “Identity crisis” (5). So taking up exams at this period of life, becomes a meticulous and a stress filled task for the students to handle it.

But, exams being important criteria in evaluation of studies, the students have to work harder to prove themselves. It is stated that due to examination stress, medical students undergo psychological, hormonal and immunological changes, and the degree of it depends upon the personality of the student, their physical activity and their spiritual involvement. The intensity of psychological issues like anxiety and depression in students are directly exhibited in student in the form of poor concentration and motivation (6). As the stress intensifies, the body reacts to it by secreting cortisol as an adaptive function. (7). Salivary cortisol is used as a psycho neuroendocrinological parameter (8). It has been reported that salivary cortisol, reflects the free cortisol level in blood (9). And since it is an alternative to plasma cortisol, it doesn't involve any invasive procedure, and is also independent of salivary secretion (10). So that it was chosen as a parameter to evaluate the stress levels of medical students undergoing examination.

In our study the result shows well comparable changes in the cortisol level before and after the exams. There is a significant increase in the level of salivary cortisol in the students who appeared for viva exams (216.41 ± 17.31) compared to the written exams (119 ± 5.48) to that of the students after the completion of their exams (17.58 ± 1.35). This parallel increase in salivary secretion, in relevance to that of stress could be because of the lack of adaptation or adjustments to the new environment or situation. It has been reported that changes in the internal or external environment alters a person's balance, and that he or she tries to rebalance. But if the effort of rebalancing fails it leads to a situation hard to manage (11). When stress is controllable it triggers stabilization and impels neuronal networks involved in generation of appropriate patterns of appraisal and coping. Whereas uncontrollable stress favors acceleration of inappropriate patterns of neuronal connection, underlying certain inappropriate behavior. Therefore both controllable and uncontrollable stress reaction process are inherent challenges to the development and essential prerequisites of adaptation of an individual behavior to the demands of the ever-changing external world. Overabundance or lack of stress reaction process leads to different psycho developmental failure or psychiatric disturbances (12).

Thus when a person faced with stress cannot control with cope mechanism, HPA axis is activated through the association of cortex, amygdala and hippocampus which causes the blood cortisol level to rise and the brain function to be affected through the neurons and the glucocorticoid receptors in the glial cells. This could be the possibility in the students who have taken up examination that the stress posed by them has activated the HPA axis and could have increased the secretion of salivary cortisol in this study. Studies have reported an increase in salivary cortisol by 9 folds in students before examination than the students after examination (13). Likewise, in another study the stress level of girls and boys, reported that significant increase of cortisol observed before the exams than after the exams (14).

Vivian NG et al., has perceived a significantly high stress in students before exams than after the exams. It stated that the increase could be because of the students being aware of the deficiencies in subjects which may have stressed. This anxiety and stress due to examination stress has shown a negative effect in their performance (15). Linn et al., 1984

has reported that the increase in the cortisol due to stress, can affect efficacy of information retrieval mechanism during exams (16). A marked increase is noted in cortisol secretion before oral exam than written exams. This could signify that the students could have undergone more stress and anxiety to face the staffs in person for a viva voce exam which could be the fact for

the increased cortisol secretion, which is not the same in the case of written exam. A similar study in anxiety and depression in medical students due to viva voce has reported that marked changes observed in the level of mood parameters and salivary cortisol secretion. Changes in cortisol showed a direct co relation with stress and anxiety (17 and 18). Likewise study has reported that oral exams routinely elicit a cortisol increase and feeling of stress. (19). These findings suggest that current medical education process may have deleterious effect on student's mental health with high frequency of depression, anxiety and stress.

Conclusion:

Students perceived significantly higher stress before oral examination and written examination. This could be due to inadequate preplanning or anxiety of exams or a feeling of incompetence to accomplish.

Secondly, the increased cortisol level may affect the information retrieval mechanism which might further aggravate anxiety which could affect the performance of the students. Therefore, for the wellbeing of the students, frequent mock written test and viva voce examination can be conducted to ease the fear of exams. Stress busting exercises can be practiced like yoga, meditation and sports to overcome anxiety and depression.

Student wellbeing not only develops a positive attitude to achieve their goals but also helps to achieve positive changes in the transition to adulthood.

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Conflict of Interest:

All the Authors declared that they do not have any conflict of interest.

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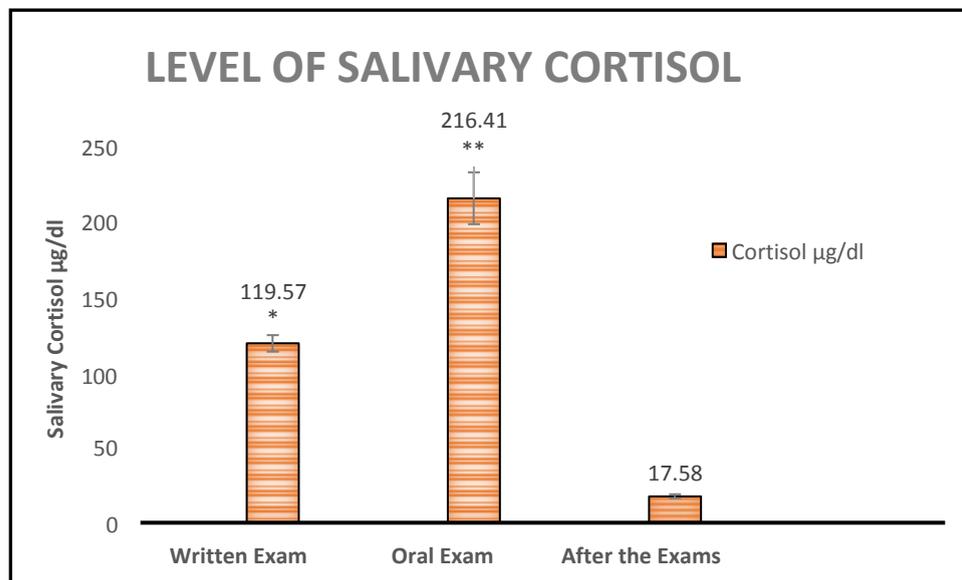
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Result:

Figure 1: Levels of salivary Cortisol in Exam going students of Written and Oral Examination.



Data presented are means±SD. Analysis of data was done by one-way ANOVA and student 't' test.

The significant difference (P<0.05) are flagged with * and (P<0.001) is **.