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ACADEMIC STRESS AND ITS EFFECT ON SALIVARY BIOMARKER AND ORAL HYGIENE AMONG MEDICAL STUDENTS

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ABSTRACT

Aim: To analyse academic stress and its effect on cortisol and gingival health among medical students. **Methodology:** Cohen's Perceived Stress Scale and a modified self-administered questionnaire was given to a convenient sample of 85 study subjects who got admission in private medical college and hospital to assess perceived stress and possible potential factors. Clinical oral examination, (Gingival health) by Modified Quigley Hein plaque Index and Loe and Silness Gingival index; Also their Unstimulated Pooled saliva samples was collected to estimate salivary bio marker i.e. cortisol level. **Results:** According to Perceived stress score by cohen, majority were stressed (score more than 13) 85% (n=73), possible potential factors like, 60% of study subjects were not staying in hostel previously, among which, majority (n=44) study subjects were stressed 87.1% of study subjects were having a nuclear family among which majority (75.3%)of study subjects were stressed. **Conclusion:** Majority of the first year MBBS students showed perceived stress, among which factors in students having experience of hostel stay showed more stress, whereas the academic stress dint had any effect on cortisol, plaque scores and gingival health. There is need to address these stressors by student advisors, peer education, and planning academic schedule and curricula of professional health sciences.

Bodies experience severe "wear and tear" to adjust to continually changing environment; it has physical and emotional effects and can create positive or negative influence resulting in stress. Stress has been defined as the body's nonspecific response to demands made upon it, or to disturbing events in the environment 1, thus it is not just a stimulus or a response, but rather a process by which we perceive and cope with environmental threats and challenges. An optimal level of stress may enhance learning. However, excessive stress has been shown to cause physical and mental health problems, reduced self-esteem, and may affect academic achievement, personal and professional development. Every individual has a certain number of coping resources, and once these coping resources are challenged or exceeded, stress usually results. Naturally everyone needs a certain amount of "pressure" to perform at their best. But when pressures exceed a person's ability to cope, the result is stress. Prolonged stress can set up distress and shut down the ability to cope with ordinary situations causing illnesses.[1]

In the medical field, a tremendous amount of stress medical students encounters in the course of their training have been attributed to the vastness in the academic curriculum, length of the course and consequent financial burden.[2]

In addition to coping with stressors of everyday life, medical students must deal with stressors specific to medical education which includes; information overload, financial indebtedness, inadequate leisure time, pressures of work, work relationships and career choices. These students also face social, emotional, physical and family problems that may affect their learning ability and academic performance. There by studies have shown that, medical students' personal distress may have

negative effects on their academic performance and health.[3]

Globally, studies have shown reported levels of stress among medical students range anywhere from 25% to 75%.[9,10] Similar studies conducted on medical students in the United states, Malaysia and Saudi Arabia have reported stress levels of 26%, 29.6% and 57% respectively and were related to their academic environment.[4,5]

The majority of stressful conditions like Depression and anxiety were found to be associated with workload, fears of failing, personal endurance, and lack of time for other activities.[6] Among stress and oral health, evidence of the association between depression and periodontitis are contradictory in the literature. Some studies showed a positive association.[7,8,9]

There are several biomarkers have been shown to be affected by psychological stress and also became markers for periodontal breakdown such as cortisol hormone, interleukin-1β (IL-1β), and interleukin-6.[11]

Whereas there is paucity about academic stress and its effect on oral health and salivary biomarker like cortisol, there by this study aimed to analyze academic stress and its effect on cortisol and gingival health among medical students.

METHODOLOGY

SOURCE AND METHOD OF COLLECTION OF DATA

Students who had got admission in Ist year MBBS course in a private medical college and hospital were taken into the study.

The study was conducted in full accordance with the ethical principles of the Institution's Ethical Committee and the World Medical Association Declaration of Helsinki.

Study purpose and procedures were fully explained to the students, and those who were willing to get involved voluntarily in the study, were involved and written informed consent[18] was obtained.

This Clinico-biochemical study consisted of a convenient sample of 85 study subjects who got admission in private medical college and hospital.

Also the following criteria's were taken into consideration.

The specific **inclusion criteria** were as follows

1. Study subjects males and females enrolled in (batch 2015) were involved into the study.
2. Study subjects signing the informed consent form after knowing the purpose, objectives, methodology of the study.
3. Study subjects should demonstrate a willingness to comply with all study procedures and clinical examination and saliva collection schedules.

The specific **exclusion criteria** were as follows\

1. Undergone oral prophylaxis in the past month
2. History of medical treatments like antibiotics, any drugs / medications that may interfere with the study design
3. Any systemic diseases, bleeding disorders and Immunological complications.
4. Subjects with acute infections.
5. Mental depression or on any psychiatric related therapy

The study is composed of following parts

1. **Questionnaire administration to evaluate stress levels –** Cohen's Perceived Stress Scale (PSS) questionnaire to assess perceived stress, and a modified self-administered questionnaire, to asses possible potential stressors of perceived stress. They were asked to fill the self-administered questionnaire without discussing with each other so as to eliminate bias.
2. **Clinical oral examination of Gingiva -** Parameters like- Modified Quigley Hein plaque Index and loe and silness gingival index was used to assess gingival inflammation among the study subjects.
3. **Salivary Biochemical estimation** – Unstimulated Pooled saliva samples were collected to estimate cortisol level. Students were asked to collect saliva after mouth rinsing with normal water making sure that, just saliva should be collected in the test tube so that mucous is not collected. The collection was done at 11 am morning as it is the ideal time for saliva collection. The saliva samples were stored at –80 °C until biomarker concentrations were measured. The procedure for salivary biochemical estimation was according to the instructions of ELISA kit by Krishgnen biosystems.

RESULTS

Among 85 study subjects, who were in age group of 17-19 years, majority were females 61.2%(n=52) followed by 38.8%(n=33) males;51 (60%)study subjects were not staying in hostel previously followed by 34 study subjects who had experience of staying in hostels, 68.2%(n=58) study subjects were having an single parent working followed by 31.8 % (n=27) with both parents working; whereas that majority were staying with nuclear family 87% (n=74) followed by joint family 12.9% (n=11)**(Table 1)**

Academic stress component was estimated by Cohen stress scale which showed that majority were stressed (score>13) 85.9% (n=73) followed by 14.1% (n=12) not stressed. Among this majority were females 54.1 %(n=46) followed by males 31.8 %(n=27); 60% of study subjects were not staying in hostel previously, among which, majority (n=44) study subjects were stressed,

followed by 40% study subjects stayed in hostels, 29 study subjects were stressed; 68.2% of study subjects were having single parent as working, among which, majority (n=49) study subjects were stressed, followed by 31.8% study subjects having with both parents working, 24 study subjects were stressed;87.1% of study subjects were having a nuclear family among which majority of study subjects (n-73) were stressed, followed by 12.9% study subjects having joint family a total of 9 subjects were stressed**. (Table 2)**

Pearson Correlation test between **Cohen stress scale scores, potential factors stress scale and Miscellaneous stress scale** with biochemical estimation values and clinical parameters showed Non significant correlation. Whereas Spearman Correlation test between **Interpersonal stress scale scores and** Clinical **skill stress scale scores** with biochemical estimation values and clinical parameters showed Non significant correlation. **(Table 3)**

Multiple linear regressions of various biochemical estimation values and clinical parameters with academic stress scores showed that, Significant inverse relation was found between miscellaneous stress scores only with Gingival index (-0.0089, $p<0.005$), whereas Non significant correlation was found between other biochemical estimation values and clinical parameters with Academic stress scores. **(Table 4)**

Gender wise Comparison by t test showed no significant difference between male and female students with respective to Cohen stress scores ($t = -0.0982$, $p >0.05$), Potential factor stress scores ($t= -0.3834$, $p >0.05$), biochemical estimation i.e. Cortisol ($t=-1.7589$, $p >0.05$), Clinical parameters i.e. Plaque index ($t=0.5858$, $p >0.05$), Gingival index ($t=0.7097$, $p >0.05$), at 5% level of significance. **(Table 5)**

Stay wise Comparison by t test showed Significant difference between students staying at hostels and day boarders with their Cohen stress scores ($t = 3.0453$, $p <0.05$). Also Significant difference was observed between students staying hostels and day boarders with their PIaque scores ($t = -2.2618$, $p <0.05$) at 5% level of confidence **(Table 6).**

DISCUSSION

Stress appears to be an unavoidable and common aspect In medical profession. The problem has however been difficult to study because individual responses to stressful situations vary and certain people are more likely than others to perceive high levels of stress in their jobs. It has many aspects like environmental experiences, subjective evaluations of a stressful situation and affective or biological responses to any event.[11]

Studying in an institute is one of the stressful stages of life, because the person experiences stressful events such as education, moving away from home, separating from family members, and changes in friendship relations. On the other hand, studying medicine, by itself, seems to be stressful.[1-5] Some studies have shown relatively high levels of distress, such as symptoms of depression and suicidal ideation in medical undergraduates.[6, 7]

In the present study, Academic stress component was estimated by Cohen stress scale which showed that majority were stressed (score>13) 85.9% (n=73) followed by 14.1% (n=12) not stressed. Among this majority were females 54.1 %(n=46) followed by males 31.8 %(n=27); results are in similar findings with the other study.[10,12,13,14] One possible reason could be due to the fact that most of the students are not adequately prepared on what to expect during the medical training

68.2% of study subjects were having single parent as working, among which, majority (n=49) study subjects were stressed, followed by 31.8% study subjects having with both parents working, 24 study subjects were stressed; 87.1% of study subjects were having a nuclear family among which majority of study subjects (n-73) were stressed, followed by 12.9% study subjects having joint family a total of 9 subjects were stressed**.** As in the modern era with rising cost of living probably single parent working status observed by their wards makes them things stressful.

Around 60% of study subjects were not staying in hostel previously, among which, majority (n=44) study subjects were stressed, followed by 40% study subjects stayed in hostels, 29 study subjects were stressed which is seen in a similar study.[15] Stress among subjects staying in hostel previously might be due to their constant pressure of being staying outside since their college days before professional course, and it has continued after joining medical course. And for study subjects not staying in hostel previously also felt stressed, which might be due to coming out of family for first time.

Around 87.1% of study subjects were having a nuclear family among which majority of study subjects (n-73) were stressed, followed by 12.9% study subjects having joint family a total of 9 subjects were stressed. This might be due to the poorer interactions with the family members by which they can't share and discuss their problems and relieve stress which is also seen in other studies[16] whereas gender wise distribution showed no differences in stress among male and female which is in according to a similar study.[17]

Whereas significant difference was observed in perceived stress in students having hostel stay experience, and among their plaque scores which is seen in other study too[12] This could be due to staying away from home after schooling, separated from family, lack of adjustment of hostel facilities like food and accommodation.

Whereas the perceived stress didn't had any effect on cortisol, plaque scores and gingival health which is observed in similar studies.[11] The relationship between periodontal status with academic stress showed no significant differences, Mahendra et al. stated that stress can be a periodontal disease risk factor, due to the change of behavioural habit to maintain oral hygiene.[18] Kuswhandani also concluded that there was a significant differences between academic stress levels with bleeding on probing index.[19] But Klages et al and Silva etal stated that cannot found a relationship between stress in daily life with dental plaque.[20]

One of the limitations of the present study would be because of the cross sectional study which precludes evaluation of temporal associations and information was collected on self-administered questionnaires; there remains the possibility of information bias. Prospective studies are necessary to study the associations between occurrence of stressors and incidence of stress.

FINAL CONCLUSION

Majority of the first year MBBS students showed academic stress, whereas the academic stress dint had any effect on salivary biomarker and oral hygiene.

There is need to address these stressors by student advisors, peer education, and planning academic schedule and curricula of professional health sciences and further to develop scientific evidence based modules to effectively manage stress in academic environment.

Table 1: Distribution of study subjects according to Gender, type of their previous stay, working status of parents and Family type.

	Frequency(Out of 85)	Percent (%)
Females	52	61.2
Males	33	38.8
Not Staying at Hostel	51	60.0
Staying at Hostel	34	40.0
Both Parent Working	27	31.8
Single Parent Working	58	68.2
Subject from Joint Family	11	12.9
Subject from Nuclear Family	74	87.1

Table 2: Cohen Stress scale scores with respect to gender, previous hostel stay, Parent working status and type of family.

Gender	< 13(Not stressed)	>=13(Stressed)
Female Count	6(7.1%)	46(54.1%)
Male Count	6(7.1%)	27(31.8%)
Total Count	12(14.1%)	73(85.9%)
Type of Previous stay		
Staying at Hostel	7(8.2%)	44(51.8%)
Not Staying at Hostel	5(5.9)	29(34.1%)
Total Count	12(14.1%)	73(85.9%)
Type of parents working status		
Both	3(3.5%)	24(28.2%)
Single	9(10.6%)	49(57.6%)
Total Count	12(14.1%)	73(85.9%)
Type of family		
Joint	2(2.4%)	9(10.6%)
Nuclear	10(11.8%)	64(75.3%)
Total Count	12(14.1%)	73(85.9%)

Table 3: Correlation between Various Perceived stress scale scores with biochemical estimation values and clinical parameters.

Parameters	**Pearson Correlation between Cohen stress scores with**		
	r-value	t-value	p-value
Cortisol value pg/ml	-0.1210	-1.0625	0.2914
Plaque Index	-0.1415	-1.2465	0.2164
Gingival Index	-0.1443	-1.2717	0.2074
Parameters	**Pearson Correlation between potential factor stress scale scores with**		
	r-value	t-value	p-value
Cortisol value pg/ml	-0.1168	-0.1168	-0.1168

Plaque Index	-0.0829	-0.0829	-0.0829
Gingival Index	-0.1525	-0.1525	-0.1525
Parameters	**Pearson Correlation between Academics stress scores with**		
	r-value	t-value	p-value
Cortisol value pg/ml	-0.1498	-0.1498	-0.1498
Plaque Index	-0.0585	-0.0585	-0.0585
Gingival Index	-0.1036	-0.1036	-0.1036
Parameters	**Spearman Correlation between Inter personal relations stress scores with**		
	r-value	t-value	p-value
Cortisol value pg/ml	0.0242	0.0242	0.0242
Plaque Index	0.0359	0.0359	0.0359
Gingival Index	0.0190	0.0190	0.0190
Parameters	**Spearman Correlation between clinical skill stress scores with**		
	r-value	t-value	p-value
Cortisol value pg/ml	-0.1303	-1.1453	0.2557
Plaque Index	0.0059	0.0512	0.9593
Gingival Index	-0.0298	-0.2599	0.7957

Table 4: Multiple linear regression analysis of various biochemical estimation values and clinical parameters with perceived stress scores.

Dependent variables	Independent variables	Estimates	SE	t-value	p-level
Cortisol value pg/ml	Intercept	26.4098	4.2756	6.1769	0.0000
	Cohen stress scores	-0.0379	0.3089	-0.1228	0.9026
	Academics stress	-0.4127	0.4604	-0.8964	0.3730
	Inter personal relations stress	1.1631	0.9294	1.2515	0.2148
	Miscleneous stress	-0.0637	0.4335	-0.1468	0.8837
	Clinical skills stress	-0.5202	0.5428	-0.9584	0.3411
	R=.21868079 R^2=.04782129				
	F(5,72)=.72321 p<0.60819 Std.Error of estimate: 11.281				
P.I	Intercept	0.3444	0.0542	6.3514	0.0001
	Cohen stress scores	-0.0043	0.0039	-1.1092	0.2710
	Academics stress	0.0042	0.0058	0.7241	0.4713
	Inter personal relations stress	0.0102	0.0118	0.8685	0.3880
	Miscleneous stress	-0.0071	0.0055	-1.2841	0.2032
	Clinical skills stress	0.0033	0.0069	0.4829	0.6306
	R=.24136348 R^2=.05825633				
	F(5,72)=.89079 p<.49195 Std.Error of estimate: .14308				
G.I	Intercept	0.1896	0.0348	5.4494	0.0000
	Cohen stress scores	-0.0008	0.0025	-0.3173	0.7519
	Academics stress	0.0011	0.0037	0.2854	0.7762
	Inter personal relations stress	0.0106	0.0076	1.4023	0.1651
	Miscleneous stress	-0.0089	0.0035	-2.5192	**0.0140***
	Clinical skills stress	0.0022	0.0044	0.4992	0.6192
	R= .33049083 R^2= .10922419				
	F(5,72)=1.7657 p<.13084 Std.Error of estimate: .09178				

Table 5: Stay and Gender wise Comparison of study subjects with various variables by t test.

Variables	Hostellers Mean	Non Hostellers Mean	p-Value	Male Mean	Female Mean	p-Value
Cohen stress scores	21.84	17.68	**0.0032***	19.25	19.39	0.9220
Total stress	22.94	18.51	0.0854	19.69	20.67	0.7025
Academics stress	8.45	6.89	0.1151	7.69	7.39	0.7651
Inter personal relations stress	1.81	2.00	0.6541	1.75	2.04	0.4943
Miscellaneous stress	8.97	6.45	0.0113	6.91	7.83	0.3617
Clinical skills stress	3.68	3.23	0.5288	3.34	3.46	0.8722
Cortisol value pg/ml	22.23	22.85	0.8108	19.97	24.43	0.0826
P.I	0.23	0.30	**0.0266***	0.26	0.28	0.5597
G.I	0.13	0.15	0.2490	0.13	0.15	0.4801

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