

The Relationship of Academic Stress to Periodontal Status and Level of Cortisol Hormone, Interleukin 1- β and Interleukin-6 in Gingival Crevicular Fluid (Study on Profession and Specialist Dental Students Faculty of Dentistry Universitas Indonesia. Jakarta)

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Abstract

To investigate the relationship between academic stress with periodontal status and level of cortisol hormone, interleukin-1 β (IL-1 β) and interleukin-6 (IL-6) in gingival crevicular fluid.

Thirty eight dental profession and 42 specialist students from Faculty of Dentistry, Universitas Indonesia, Jakarta were examined. This study was measure perceived stress used The Dental Environment Stress (DES) and The Graduate Dental Environment Stress (GDES) questionnaire; periodontal condition using modified Russel periodontal index, and examined the levels of hormone cortisol, IL-1 β and IL-6 samples with ELISA test. T-test and Mann-Whitney analysis were as statistical analysis.

In dental profession students group the relationship between academic stress level to cortisol level showed significant differences ($p=0,025$), meanwhile IL-1 β and IL-6 showed no significancy.

There is a relationship between academic stress to level of cortisol hormone in dental profession.

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Introduction

Periodontal diseases are inflammatory conditions caused by infection with subgingival bacteria and host response alterations.^{1,2} Research has shown the aetiology of periodontal disease to be multifactorial.^{1,3,4} Although specific microorganisms in subgingival microflora are determinant agents for periodontitis, host defense mechanisms within periodontal tissues also play a role in periodontal breakdown.^{1,3} There are a few certain risk factors for periodontal disease, including systemic conditions. smoking and age.^{1,3,5} One factor

which is known to affect individual's susceptibility to periodontal disease is psychosocial factor.³

Psychological conditions particularly stress has been implicated as risk indicators for periodontal disease.³ Over the past decade. academic stress among dental students has become a frequent topic for researches. In general, three distinctive categories of stress provoking factors can be distinguished into faculty related factors, study related factors, and student related factors.⁶

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-1 β (IL-1 β), and interleukin-6 (IL-6).⁷⁻⁹ Cortisol level are related to pscycological condition, but the connection to periodontal disease have not been clear.^{3,10,11} Meanwhile, stressor could directly affected imun cells and modulated secretion of inflammatory cytokines, such as IL-1 β and IL-6.

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Interleukin-1 β is a key mediator in processes of the immune responses.^{12,13} Over production of IL-6 are associated with conditions related to age such as cardiovascular disease, osteoporosis, arthritis, type 2 diabetes mellitus, and periodontal disease.¹⁴

Therefore this study is aiming to investigate the relationship between academic stress to periodontal status and level of cortisol hormone, IL-1 β and IL-6 in gingival crevicular fluid in dental profession and specialist students Faculty of Dentistry Universitas Indonesia.

Materials and methods

Subjects

Thirty eight dental profession students (all female; aged 20-24 years; first year and second year) and forty two specialist dental subjects (all female, aged 25-50 years; 21 married and 21 unmarried) from faculty of dentistry, Universitas Indonesia participated in this study. They recruitment from consecutive sampling. Inclusion criteria was each subject minimum had twenty teeth not include wisdom tooth. The questionnaire about stress (Graduate Dental Environment Stress/GDES and Dental Environment stress/DES) and informed consent was filled by the subject.^{6,15} Exclusion criteria applied either due to potential risks for the subjects such as students in menstruation periode and pregnancy, use of oral contraceptives or estrogen, systemic diseases (cardiovascular, neurologic disease, diabetes mellitus, adrenal disorder, disease of the immune system, psychiatric diseases etc), drugs consumption (antideprection, analgetic, anticonvulsan, antihistamin, muscle relaxan), smoking, crowding and using orthodontic or dental appliances. None had received antibiotics during the previous 3 months.

Ethics

This study was approved by ethics committee at Faculty of Dentistry, Universitas Indonesia, Jakarta. The subjects gave their informed consent to participate in the study.

Graduate Dental Environment Stress and Dental Environment Stress

The GDES questionnaire asseses sources of stress associated with undergraduate course work and training in spesialist dental students.¹⁵ The questionnaire was consist 32-item questions based on a four-point Likert scale,

with scores ranging from one (not stressful) to four (very stressful). The DES questionnaire asseses sources of stress associated with undergraduate course work and training in dental students.⁶ The questionnaire was consist 37-item questions based on a four-point Likert scale, with scores ranging from one (not stressful) to four (very stressful). Criterion of academic stress were mild, moderate and severe.

Clinical assesment

The periodontal status was assesed using Russel periodontal index. Score 0 showed no inflammation; 1 showed mild gingivitis with an overt area of inflammation in the free gingiva, but this area did not circumscribe the tooth; 2 showed gingivitis with inflammation completely circumscribed the tooth, but there was no apparent break in epithelial attachment; 6 showed gingivitis with pocket formation; 8 showed periodontitis with advanced destruction, mobility, positif in percussion.

Collection of gingival crevicular fluid

Crevicular fluid was collected mesiobuccal from teeth 16 to 26 and 46 to 36. Prior to crevicular fluid sampling the patients were using cheek retractor, the respective tooth was dried by isolation with cotton rolls and a gentle air stream. A paper point was inserted 1 mm into gingival crevice and remained there for 15 sec. The paper point then inserted into tube eppendorf with 500 μ l Phosphate Buffer Saline and kepted in temperature -80° C. The protein in GCF was analyzed using Bradford method.

Cortisol, Interleukin-1 β and Interleukin-6 ELISA assay

Cortisol was measured with the sensitive AccuDiag Cortisol ELISA Kit (Diagnostic Automation/Cortez Diagnostics, Inc) in accordance with the manufacturer's instructions. Meanwhile, the assesment of interleukin-1 β and interleukin-6 level in GCF was using ELISA assay (Komabiotech®).

Statistical analysis

Descriptive and bivariate methods were used for data presentation and analysis. Summary statistics (proportions, mean and standard deviation (SD) were used to summarize the responses to the GDES and DES items, as well as the participant's demographic information. The standard distribution was checked with the Shapiro–Wilk test. As it was normal distribution the analysis using independent T-test, but as not a case of normal distribution, the Mann–Whitney

test was used to compare cortisol, IL-1 β and IL-6 levels in GCF, clinical parameters and level of stress between subjects.

Results

This research was held from at Periodontia clinic, September-October 2013 at Dental Hospital of Faculty of Dentistry, Universitas Indonesia.

The distribution of academic stress in relation with dental students (profession and specialist) showed there are only mild and moderate stress level among them. The majority of moderate stress level shown in the second year group of profession students and married group of specialist students. (Tabel 1)

Dental	N	Academic Stress Score		p value
		Mild N (%)	Moderate N (%)	
Profession	38			0.358
First year		7 (18.4%)	11 (28.9%)	
Second year		5 (13.2%)	15 (39.5%)	
Spesialist	42			0.525
Married		7 (16.7%)	14 (33.3%)	
Single		9 (21.4%)	12 (28.6%)	

Chi-Square Test; p < 0.05 = significant

Table 1. Distribution and Relation between Academic Stress and Dental Student.

The average DES score of dental profession students (81.21 \pm 14.43) were higher compared to GDES score of specialist students (64.07–15.56) (Tabel 2).

Score	N	Mean \pm SD	Min - Max
DES	38	81.21 \pm 14.43	55.00 – 110.00
GDES	42	64.07 – 15.56	37.00 – 96.00

*DES : Dental Environment Stress; GDES: Graduate Dental Environment Stress

Table 2. Distribution Mean, Standard Deviation, Minimum and Maximum Academic Stress Score of Dental Student.

Shapiro-Wilk test showed that in profession student, the relationship between IL-1 β and stress level were normal, but not with the relationship between stress level and periodontal status, IL-6, and cortisol level. In specialist student, there were no normal distribution of periodontal status, IL-1 β , IL-6, and cortisol level (Tabel 3)

Dental Student	Profession (N=38)	p value	
		Specialist (N=42)	
Periodontal Status			
Mild Stress	0.12*	0.00	
Moderate Stress	0.024	0.16*	
Level IL-1 β			
Mild Stress	0.27*	0.10	
Moderate Stress	0.12*	0.00	
Level IL-6			
Mild Stress	0.17*	0.03	
Moderate Stress	0.00	0.15*	
Level Cortisol			
Mild Stress	0.03	0.01	
Moderate Stress	0.01	0.00	

Shapiro-Wilk test; *p > 0.05 = normal distribution

Table 3. Normal Distribution of Periodontal Status, Level of Interleukin-1 β , Interleukin-6 and Cortisol of Gingival Crevicular Fluid in Dental Student.

Dental Student	N	Level of GCF		p value
		Mean \pm SD		
Profession				
Cortisol (ug/ml)				0.025*
Mild Stress	12	1.15 \pm 0.17		
Moderate Stress	26	1.24 \pm 0.14		
IL-1 β (pg/ml)				0.956
Mild Stress	12	70.69 \pm 27.85		
Moderate Stress	26	70.11 \pm 31.00		
IL-6 (pg/ml)				0.621
Mild Stress	12	-4.30 \pm 14.91		
Moderate Stress	26	-0.52 \pm 24.11		
Spesialist				
Cortisol (ug/ml)				0.41
Mild Stress	16	0.58 \pm 0.26		
Moderate Stress	26	0.51 \pm 0.23		
IL-1 β (pg/ml)				0.92
Mild Stress	16	14.38 \pm 13.82		
Moderate Stress	26	14.23 \pm 55.53		
IL-6 (pg/ml)				0.36
Mild Stress	16	-26.44 \pm 12.40		
Moderate Stress	26	-23.36 \pm 14.36		

*Independent T-Test; **Mann-Whitney Test; p<0.05 significant

Table 4. Distribution and Significancy Association between Stress Academic Condition of Dental Student With Level of Cortisol Hormon, Interleukin-1 B, and Interleukin-6 of Gingival Crevicular Fluid.

The relationship level of IL-1 β to academic stres level was analyzed using independent T-test showed there were no significant relation

between academic stress level (light and moderate stress) with the level of IL-1 β ($p=0,956$). The relationship between academic stress with periodontal status, IL-6 and cortisol level in dental profession student was tested using non parametric test, Mann Whitney. There were no significant relationship between academic stress and periodontal status in dental profession student ($p=0,479$). This result also showed in the relationship between academic stress and IL-6 level in dental profession student, which were no significant level differences ($p=0,621$). Meanwhile, the test on the relationship of academic stress with cortisol level in dental profession student showed a significancy, because p value was 0,025.

The relationship between periodontal status, IL-1 β , IL-6, and cortisol level with academic stress level in specialist dental student, were tested using Mann-Whitney, and showed no significant differences on each groups. (Tabel 4).

Discussion

The present study showed that prevalence of academic stress in dental profession student higher than specialist dental student. Although, no significant different after statistical analysis. There is no recent studies that comparing both groups.

The relationship between periodontal status with academic stress showed no significant differences, both in dental profession and specialist students. Mahendra et al. stated that stress can be a periodontal disease risk factor, due to the change of behavioural habit to maintain oral hygiene.¹⁶ Kuswhandani also concluded that there was a significant differences between academic stress level with bleeding on probing index.¹⁷ But, Klages et al., stated that Silva et al. can not found a relationship between stress in daily life with dental plaque.¹⁸

This study showed no significancy differences on IL-1 β level between mild and moderate stress in profession and specialist dental student. This result similar with Johannsen et al. observed that there was no significant differences on IL- β level on 20 dental hygienist at exam and non exam periode.¹⁹ This result similar with Dugue et al. that can not found the correlation between stress and IL-1 β in human.²⁰ Meanwhile, Deinzer showed there was an increase on IL-1 β in stress condition, with a

significant differences when compared with no stress condition.²¹ The relationship between academic stress with IL-6 level, in both profession and specialist dental students showed no significant differences. Mengel et al. also did not find correlation between immunologies mediator such as IL-1 beta and IL-6 with stress.²² But, Johannsen et al. found that there were significant differences of IL-6 level on depressed women.²³

The relationship between cortisol hormone and stress level on profession dental student was analyzed using Mann-Whitney test. This test showed that there was a significant differences. According to Deinzer (1992), stress condition can increase cortisol hormone level.¹⁰ This result did not showed in specialist student group. Several studies also stated that there were no correlation between cortisol level and psychological stress.^{22,24,25}

Conclusions

There is a relationship between academic stress to the level of cortisol hormone in dental profession in faculty of dentistry Universitas Indonesia.

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Declaration of Interest

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