The Relationship of Academic Stress to Periodontal Status and Level of Cortisol Hormone, Interleukin-1β 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-1β (IL-1β) 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-1β 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-1β and IL-6 showed no significance. There is a relationship between academic stress to level of cortisol hormone in dental profession.


Keywords: Academic stress; periodontal status; cortisol hormone level; interleukin-1β level; interleukin-6 level.

Received date: 28 March 2016

Accept date: 11 May 2016

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-1β (IL-1β), and interleukin-6 (IL-6).7-9 Cortisol level are related to psychological 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-1β and IL-6.
Interleukin-1β 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-1β 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 (antidepretion, 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 assesses sources of stress associated with undergraduate course work and training in specialist 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 assesses 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 assessment
The periodontal status was assessed 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 messiobuccal 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 µl Phosphate Buffer Saline and keeped in temperature -80° C. The protein in GCF was analized using Bradford method.

Cortisol, Interleukin-1β 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-1β 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-1β 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)

| Table 1. Distribution and Relation between Academic Stress and Dental Student. |
|-------------------------------|-----------------------------|-----------------------------|
|                              | Dental Student              | p value                     |
|                              | N                            | Mild Stress N (%) | Moderate Stress N (%) |
| Profession                   |                              | 38                         | 38                        |
| First year                   | 7 (18.4%)                    | 11 (28.9%)                |
| Second year                  | 5 (13.2%)                    | 15 (39.5%)                |
| Specialist                   |                              | 42                         | 42                        |
| Married                      | 7 (16.7%)                    | 14 (33.3%)                |
| Single                       | 9 (21.4%)                    | 12 (28.6%)                |

Chi-Square Test: p < 0.05 = significant

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

| Table 2. Distribution Mean, Standard Deviation, Minimum and Maximum Academic Stress Score of Dental Student. |
|---------------------------------|-----------------------------|-----------------------------|
| Score                           | N| Mean ± SD | Min - Max |
| DES                            | 38 | 81.21 ±14.43 | 65.00 – 110.00 |
| GDES                           | 42 | 64.07 ±15.56 | 37.00 – 98.00 |

Shapiro-Wilk test showed that in profession student, the relationship between IL-1β 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-1β, IL-6, and cortisol level (Tabel 3)

| Table 3. Normal Distribution of Periodontal Status, Level of Interleukin-1β, Interleukin-6 and Cortisol of Gingival Crevicular Fluid in Dental Student. |
|---------------------------------|-----------------------------|-----------------------------|
| Dental Student                  | p value                     |
|                              | Profession (N=38) | Specialist (N=42) |
| Periodontal Status             |                         |                           |
| Mild Stress                    | 0.12*                     | 0.00                       |
| Moderate Stress                | 0.024                     | 0.16*                      |
| Level IL-1β                    |                           |                           |
| 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

The relationship level of IL-1β to academic stress 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-1β (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 significance, because p value was 0.025.

The relationship between periodontal status, IL-1β, 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 significance differences on IL-1β 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 period.19 This result similar
with Dugue et al. that can not found the
correlation between stress and IL-1β in human.20
Meanwhile, Deinzer showed there was an
increase on IL-1β 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 analized 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.

Acknowledgements

This study was supported by Riset Hibah
Madya 2013 DRPM Universitas Indonesia.
Jakarta. Indonesia.

Declaration of Interest

The authors report no conflict of interest
and the article is not funded or supported by any
research grant.

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