

Investigation of the Relationship Between Occupational Stress and Temporomandibular Joint Disorders by Measuring Salivary Cortisol and Immunoglobulin a Levels in Students of Qom Dental School

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Research Article

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Abstract

Objectives

Occupational stress is defined as a lack of coordination between job requirements and individual abilities. This stress relates to several salivary biomarkers. Stress plays an important role in creating temporomandibular disorder (TMD). In this study we aimed to investigate the relationship between stress and TMD by examining the occupational stress using dental environment stress (DES) questionnaire and measuring the stress markers in saliva including cortisol and immunoglobulin A in fourth to sixth year students of Qom Dental School.

Methods

In present study, 60 students participated. At first, a clinical examination was performed based on the RDC/TMD method to determine the temporomandibular joint status, then a DES questionnaire was completed to determine the occupational stress level and finally a sample of saliva was taken from the students and the amounts of salivary cortisol and IgA were measured by enzyme-linked immunosorbent assay (ELISA).

Results

The mean cortisol and IgA levels were 4.74 ± 2.80 ng/ml and 220.26 ± 121.22 μ g/ml, respectively and the mean score of the DES questionnaire was 2.48 ± 0.58 . In this study, 24 patients (40%) suffered from TMD. There was no correlation between cortisol and IgA levels with the DES score (p value > 0.05). There was no significant relationship between TMD and three variables of cortisol, IgA and DES scores (p value > 0.05).

Conclusion

Stress is one of the most important causes of TMD. Salivary biomarkers can be useful markers for determining stress in people with TMD but this issue was not confirmed in our study.

Clinical relevance:

In this study, no relationship was observed between TMD and occupational stress.

Introduction

Temporomandibular joint disorders (TMD) are one of the most common problems for dental office patients, and about 40–60 % of the population have at least one significant symptom of these disorders(1). According to research, stress is considered as one of the main etiological factors in TMD(2).Occupational stress is defined as a mismatch between one's job needs and one's abilities, capabilities, and desires and it has various physical, psychological and behavioral effects (3). Due to general course of dentistry is relatively long, dental students are often more stressed during their training and are more anxious than the general population (4–6). Salivary cortisol and secretory IgA are considered as markers of stress in several studies(7, 8).

Collection of saliva is easy, non-invasive and less infection transmission risk (9), so this study designed to determine the salivary levels of cortisol and secretory IgA and to assess the relationship between occupational stress and TMD in student of Qom Dental School.

Material And Method

This cross-sectional study was performed on 60 fourth to sixth year's students of Qom Dental School. The Dental Environment Stress (DES) questionnaire was used to measure students' subjective stress, which included demographic information and 37 questions about stressors in the dental environment.

Inclusion criteria

fourth – sixth year dental students with complete dental arches.

Exclusion criteria

students with systemic disease affecting the joints, using medications such as steroids and oral contraceptives and antipsychotics, trauma to the face or jaw, Cushing's syndrome, Addison's disease, pregnancy, removable prostheses and TMD patients with severe pain.

After receiving the informed consent forms, unstimulated saliva samples were collected from all participants according to standard method(9). The levels of cortisol and secretory IgA were measured by ELISA Kit (Dia Metra Co) and for determining the condition of TMD, a clinical examination was performed by a single examiner for all participants. The analysis was based on the simplified version of RDC / TMD (Research Diagnostic Criteria / Temporomandibular Disorder), which includes a questionnaire and clinical examinations.

Statistical analysis

The collected data were analyzed using SPSS software. The results were presented as mean \pm SD and analyzed by independent t-test, Anova test, non-parametric chi square test, and Pearson's correlation coefficient tests. The level of significance was assumed to be $P < .05$.

Result

Based on analysis of RDC / TMD, 24 (40%) students had TMD and prevalence of TMD was higher in women than men but this difference was not significant. Fear of not passing the courses has maximum stress in students in DES questionnaire. But differences in this study were not significant (p value > 0.05). Comparison of cortisol and IgA levels and DES questionnaire score between academic years, and the relationship between TMD and cortisol levels and IgA levels show in Table 1&2.

Table 1
comparison of cortisol and IgA levels and DES questionnaire scores between different school years

Parameter	Year	Mean ± Std. Deviation	P - value
Cortisol	fourth year	4.40 ± 1.68	0.85
	fifth year	4.70 ± 3.52	
	Sixth year	4.90 ± 2.94	
IgA	fourth year	252.14 ± 122.32	0.23
	fifth year	174.10 ± 97.29	
	Sixth year	226.19 ± 126.99	
DES questionnaire score	fourth year	2.50 ± 0.75	0.87
	fifth year	2.54 ± 0.53	
	Sixth year	2.44 ± 0.53	

Table 2
Relationship between TMD and three variables of cortisol levels, IgA levels and DES questionnaire scores

Parameter	Mean ± Std. Deviation	TMD	P - value
Cortisol	4.98 ± 3.73	Existent	0.58
	4.57 ± 2.01	Non existent	
IgA	229.87 ± 135.08	Existent	0.64
	215.02 ± 112.67	Non existent	
DES questionnaire score	2.59 ± 0.55	Existent	0.20
	2.40 ± 0.59	Non existent	

Among the participants 13.3% had muscular tenderness, 1.7% had Restriction of jaw movements, 3.3% had ear pain, 5% had chronic headache, 26.7% had neck pain, 33.3% had joint sound, 1.7% had Habitual dislocation of joint and 5% had Locking of the jaw in closed mouth.

Among those who had joint sound, 22.7% had click sound, 1.7% had pop sound and 3.3% had crepitus sound.

According to the Table 3 there is no significant relationship between cortisol and IgA level and DES questionnaire score.

Table 3
correlation between and three variables of
cortisol levels, IgA levels and DES
questionnaire scores

		cortisol	IgA
cortisol	Correlation		0.08
	p value		0.53
IgA	Correlation	0.08	
	p value	0.53	
DES Score	Correlation	-0.10	0.01
	p value	0.44	0.88

Discussion

In general, craniofacial pain and disability is a health problem that affects a large population. TMD fall into this category (10). The most common symptom of TMD is pain, which is usually present in the masticatory muscles, areas around the ears, eyes, throat, and temporomandibular joint, as well as cause pain in head and neck. In addition to pain, patients with TMD usually have limited or asymmetrical jaw movements and jaw sounds such as click, pop, and crepitus (11). Stress is considered as one of the main etiological factors in dysfunction of the masticatory system(2). Dental students are often more stressed during their training than the general population(6). In this study the relationship between occupational stress and TMD was investigated by measuring salivary cortisol and immunoglobulin A levels in students Dental School. According to our results, the mean score of DES questionnaire in students was 2.48 ± 0.58 . There was only a significant difference between the academic years and evaluation of clinical performance by the professor ($p = 0.03$) that in fifth year students was significantly higher than fourth- and sixth-year students. There were no significant differences between other parameter in this study. In several studies, similar to our study, the factors of exams, fear of falling and not passing the courses among the students of different dental schools are the most stressful factors (12–15). Also, it has been reported that female students had a higher stress than male students. Higher stress in girls can be attributed to issues such as feeling more pressured to succeed, receiving less support from friends, and girls being more vulnerable(12, 14, 16).

Cortisol is considered the physiological marker of stress. When stress is perceived by the individual, the HPA(Hypothalamic–pituitary–adrenal) axis is activated and the end result is the secretion of cortisol from the adrenal glands. Measuring cortisol saliva is a reliable tool for measuring the activity of the HPA axis(7). The correlation between salivary cortisol and plasma cortisol is greater than 0.9(17). Therefore, salivary cortisol can be considered equivalent to serum, and salivary cortisol is used today as a stress index, and like plasma cortisol, the concentration of salivary cortisol is a reliable marker for stress(18). Secretory IgA in saliva is the main immunological factor at the mucosal level and has been shown to be sensitive to psychological variables(19). The circadian rhythm of salivary secretory IgA concentration is closely related to the circadian rhythm of salivary cortisol(20). Salivary secretory IgA has been used in several studies as a stress marker(8). In our study there were no correlation between these markers' levels with DES questionnaire score and TMD. Vivian Ng reported that students with more stress had higher salivary cortisol levels before the exam(21). In other study, more stress was associated with significantly lower IgA concentration in saliva(19). In this study, 24 patients (40%) had TMD, although no significant correlation was found between TMD and three variables of cortisol level, IgA level and DES questionnaire score. In some studies showed that people with TMD have significantly higher levels of stress and anxiety(1, 7). The lack of significant differences between our findings may be due to small sample size. In the present study, the prevalence of TMD was 40%. In similar studies the prevalence of TMD was 54%(22) and 58%(23). The difference in the prevalence of TMD may be due to diagnostic criteria and the use of different scales. Prevalence of articular sounds in our study were similar to Mahshid and Wieckiewicz studies (24) (23).

Conclusion

In this study, 24 patients (40%) had TMD. There was no correlation between cortisol and IgA levels and DES questionnaire score (p value > 0.05). There was no significant relationship between TMD and three variables of cortisol level, IgA level and DES questionnaire score (p value > 0.05). For more detailed evaluation, more studies with higher sample size are needed.

Declarations

Ethics approval and consent to participate

All procedures performed in studies involving human participants were reviewed and approved by the institutional review board and in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study. This research has been approved with ethics code IR.MUQ.REC.1397.166 in Qom University of Medical Sciences.

Consent for publication

Not applicable

Availability of data and materials

Not applicable

Competing interests

The authors have no conflict of interest to declare.

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Authors contributions

YB conceived the study and designed the research and participated in manuscript editing. SH participated in the design and and planning of the research. EK wrote the manuscript and conducted literature research. AM analyzed the data and AK contributed to data acquisition. All authors read and approved the finalversion of the manuscript.

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