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RESEARCH ARTICLE

ASSOCIATION BETWEEN STRESS AND TEMPOROMANDIBULAR DISORDER SAMONG STUDENTS OF FINAL YEAR AT KING KHALID UNIVERSITY COLLEGE OF DENTISTRY/ ABHA- KINGDOM OF SAUDI ARABIA

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ABSTRACT

Introduction: Stress is considered to be the main factor responsible for the development of temporomandibular disorders. (TMD) These factors are more commonly seen to cause TMD in professional college students. The aim of this study is to correlate the stress factors in development of temporomandibular disorders (TMD) in professional college students at two different times: six months before and one on the week before their college semester final examinations.

Methods: The survey was conducted using a questionnaire, consisting of age, sex, college specialty and 11questions addressing trismus, joint noise, pain, clenching in the daytime, nocturnal bruxism, stress and previous history of TMJ disorder. The survey was performed between September 2014 and July 2015, and the total number of subjects was 275. There were 126 males and 149 females and 98% of the group were above the age of 20. The relationships between questions were examined by the chi-square test. The level of significance was set at 0.05.

Results: The prevalence rate of signs and symptoms of TMD, headache was 32% at the beginning of the semester and it was found to be slightly higher one week before the exam with 36.7%. Joint noise reported by 18.2% of the students at the beginning of the semester and a slightly higher 20.4% at one week before the examination. Pain in or around the jaw was also found to have a significant presence among the study group at both times. Stress was seen to be significantly associated with many reported signs and symptoms of TMD reported at one week before exam such as pain in or around jaws when opening and closing mouth, joint noise, night PFH and day PFH.

Conclusion: It was concluded that students preparing to take professional college examinations are high risk group for developing temporomandibular disorder due to psychological factors causing anxiety and stress. The symptoms become more significant as the semester progresses, and both anxiety and stress increase as the examination dates approach.

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INTRODUCTION

Temporomandibular disorder (TMD) is a term that refers to a group of orofacial disorders associated with the temporomandibular joint (TMJ) and the masticatory muscles which present as pain in the TMJ, fatigue of masticatory muscles, limitation of mandibular movement and clicking sounds. Due the complexity of the masticatory system, TMD symptoms have the tendency to arise from etiological factors that includes both physiological and/or psychosocial factors, such as malocclusion and occlusal interferences, injury to masticatory muscles, direct trauma to the jaw or TMJ, micro trauma caused by continuous parafunctional habits such as clenching, bruxing, alterations secondary to stress or a combination of all of the above (Guidelines for Diagnosis and Management of Disorders Involving the Temporomandibular Joint and Related Musculoskeletal Structures, 2003; de Santi's *et al*., 2017; Manfredini and Lobbezoo, 2017; Bonjardim *et al*., 2017). Temporomandibular disorder (TMD)-associated pain is the third most prevalent chronic pain condition worldwide, after tension headaches and back pain. Its international prevalence has been demonstrated in several studies to affect

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between 10% to 25% of the population, (Dworkin, 2011), and (Dimova *et al*., Gremillion, 2000; LeResche, 1997; Manfredini and Lobbezoo, 2008) with an annual incidence of 2% and 4% (Slade *et al*., 2017; Slade *et al*., 2016) and (Von Korff *et al*., 1993). In other studies, it was shown to range from 20 to 50%, with variability being attributed to different factors such as race, sampling design and criteria and data collection methods (Habib *et al*., 2015). The prevalence of TMD related pain is usually less until adolescence, with not much of significance between males and females, but it tends to peak between the ages of 20 to 40 years with women being more affected than men (Ferreira *et al*., 2017; LeResche, 1997) and (Liu and Steinkeler, 2013). Matthews (Strausbaugh and Levine, 2007) defines stress as the processes and responses associated with adaptation to demanding or challenging environments, but stress is also commonly conceived as any stimulus to which the organism is not adapted (Mathews, 2017). Anxiety and stress disorders affect the whole population and different economic classes, predominantly women and young people over 18 years of age. It may be associated to genetic or environmental factors or life experiences.

In 1969, Daniel Laskin proposed the psycho physiological theory of myofascial pain, where stress is defined as a major causal factor. According to this theory, stress induces muscle hyperactivity which results in fatigue and in turn causes muscle spasms that eventually result in several conditions such as: contracture, occlusal disharmony, internal derangement and degenerative arthritis. All of the previously mention factors cause alterations in the occlusal pattern during mastication, and these alterations would eventually be the effect rather than the cause of the pain-dysfunction syndrome. Different studies have confirmed that patients with myofascial pain suffer increased levels of depression and somatization than those diagnosed only with disc displacement (Ferrando *et al*., 2004). Temporomandibular joint (TMJ) function has been the subject of considerable study for over a century, and despite the availability of voluminous literature, the multifactorial etiology of TM dysfunction keeps it a fertile area for research and interventions (Wadhwa *et al*., 1993). To highlight the importance of the need of further research this area, The WHO report presented oral diseases as major public health problems and called for consideration of the impact of pain and suffering, impairment of function and effect on quality of life in the context of GLOBAL burden of disease and regarding TMD as a cause of disability and hence health impairment (http://www.who.int/oral_health/publications/world-oral-health-report-2003/en/). Which in turn increases the need for input to health decision-making and planning process regarding such a debilitating condition. The TMDs tend to cause a loss of 18million work days per year for every 100 million working adults, which in turn greatly affects the gross productivity (https://www.nidcr .nih.gov/AboutUs/Councils /NADCRC/) (Maixner *et al*., 2011). Chronic facial pain, including pain associated with TMD, is most often caused by myo-arthropathy of the masticatory system, and unfortunately, facial pain often persists long after any identifiable organic pathology has healed. Moreover, in a subgroup of patients with temporomandibular disorder (TMD), no treatment is effective. Which further adds to its burden and overall effect on a patient (Galli *et al*., 2009; Gui *et al*., 2015). Only a few studies have reported the prevalence of TMD signs among Saudi Arabian adult population, which was found to be 21.3% with joint sounds being the most prevalent sign. While TMD symptoms were found to be 33% as, with headache being the most prevalent (Feteih, 2006). Other reports were on signs and symptoms of TMD in specific patient subjects such as military students (Nassif *et al*., 2003), dental students (Nourallah and Johansson, 1995) and female patients seeking orthodontic treatment (Akeel and Al-Jasser, 1999). A student preparing for a university examination is usually under a great stress and psychosocial disturbance especially during examination period, which has great impact on their future and chosen careers. The age group to which most of these students belongs to, complicates even further their response to stress and anxiety (Reis Diniz *et al*., 2017). The stress and anxiety are considered to be the key factor responsible for the development of temporomandibular disorders. These factors are more commonly seen to cause TMD in professional college students. In Brazil, it was reported that the TMD prevalence for this population ranged from 53.21% to 68%. Casanova-Rosado, *et al*. (2006), found a TMD prevalence of 46.9% and Shiau and Chang (Maixner *et al*., 2011) (1992) reported a prevalence of 42.9% (Callister *et al*., 2017).

The aim of this study is to correlate the stressfactors in development of temporomandibular disorders (TMD) in professional college students at two different times: six months before and one the week before their college semester final examinations.

METHODS

An interview survey was performed using a questionnaire, consisting of age, sex, college specialty and 11questions address trismus, joint noise, pain, clenching in the daytime, nocturnal bruxism, and stress previous history of TMJ disorder. The final year medical and dental students from King Khalid University; both male and female, were randomly selected and were asked to answer these questions with yes or no. The questionnaire was administered at two different occasions, at the first month of the semester and a week before their college final semester examination. An Arabic translation of the standard questionnaire recommended by McNeill *et al*. for evaluation of anxiety and TMD problems was used to collect data from students (Guidelines for Diagnosis and Management of Disorders Involving the Temporomandibular Joint and Related Musculoskeletal Structures, 2003). The survey was performed between September 2014 and July 2015, and the total number of subjects was 275. There were 126 males and 149 females and 98% of the group were above the age of 20. The relationships between questions were examined by the chi-square test. The level of significance was set at 0.05. This study protocol was approved by the research committee of college of dentistry King Khalid University.

RESULTS

Participants in the study were a total of 275 students, out of which 126 were male (46%) and 149 were female (54%). Almost all of the participants were above the age of 20 (98%) as demonstrated in Table 1. The results showed that the percentage of students who felt stressed had increased from 21.8% at the beginning of the semester to 52.4% one week before the exam. With regard to gender and stress, all the males reported feeling stressed 1 week before the exam than females (12.1%), while at the beginning of the semester more females reported being stressed than males (94% versus 60% respectively). Those above the age of 20 have reported being more stressed than those below at both times 154 (57.5%) have reported being stressed. (p=0.005).

Table 1. Distribution of the background factors among final semester students

Demographic variable		Frequency	Percent
Gender	Male	126	45.8
	Female	149	54.2
Age group	<20	6	2.2
	>20	269	97.8
Stress either at beginning or at one week before exam	Yes	234	85.1
	No	41	14.9

Table 2. Distribution of risk factors associated with TMD

Risk factor	Beginning of semester Pre	1 week before exams post	P-value
Feeling stressed	154 (56%)	144 (52.4%)	0.442
Daytime PFH	87 (31.6%)	79 (28.7%)	0.008
Sleep PFH	50 (18.2%)	54 (19.6%)	0.125
Recent injury	14 (5.1%)	22 (8%)	0.115
Treatment for jaw problem	13 (4.7%)	5 (1.8%)	0.008

Table 3. Distribution of reported signs and symptoms of TMD at the beginning of the semester and one week before the exam

TMD signs and symptoms	Beginning of semester/ Pre	1 week before exams/ post	P-value
Pain in jaw when opening or closing	25 (9.1%)	36 (13.1%)	0.001
Pain in or around jaw when opening and closing	32 (11.6%)	34 (12.4%)	0.5
Difficulty in opening	24 (8.7%)	29 (10.5%)	0.063
Joint noise	50 (18.2%)	56 (20.4%)	0.031
Stuck or expelled jaw	23 (8.4%)	18 (6.5%)	0.063
headaches	88 (32%)	101 (36.7%)	0.00

Table 4. The associations between stress and signs and symptoms of TMD reported a week before exam

Stress	Pain in or around jaws when opening and closing the mouth	Difficulty while opening the mouth	Noise during opening and closing the mouth	Does your jaw get "stacked" "locked" or "go out"?	Night PFH	Day PFH
Yes	34 (14.5%)	29 (12.4%)	56 (239%)	18 (7.7%)	54 (23.1%)	79 (33.8%)
No	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
P value (Calculated by Fisher's Exact Test)	0.004	0.011	0.000	0.085	0.000	0.000

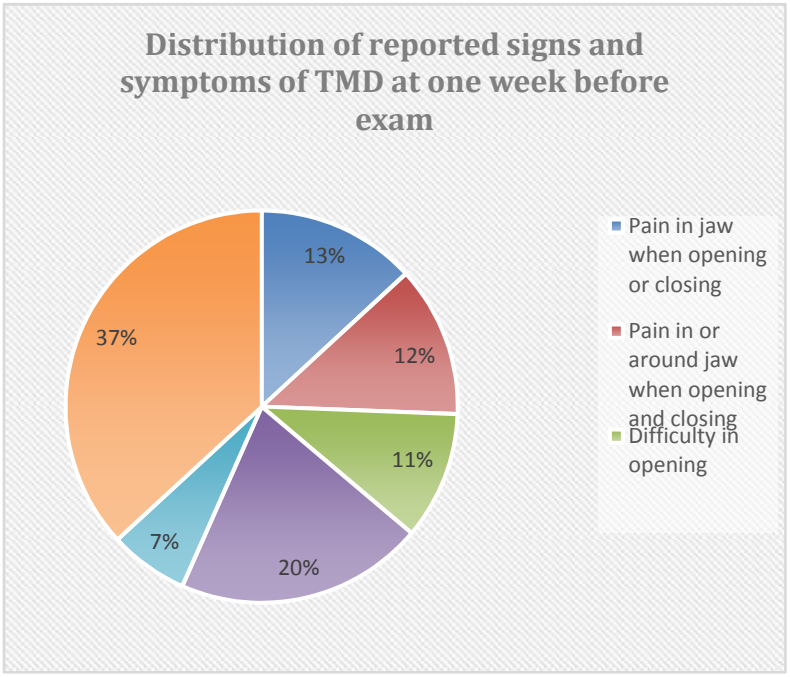

Figure 1. Distribution of reported signs and symptoms of TMD at one week before exam

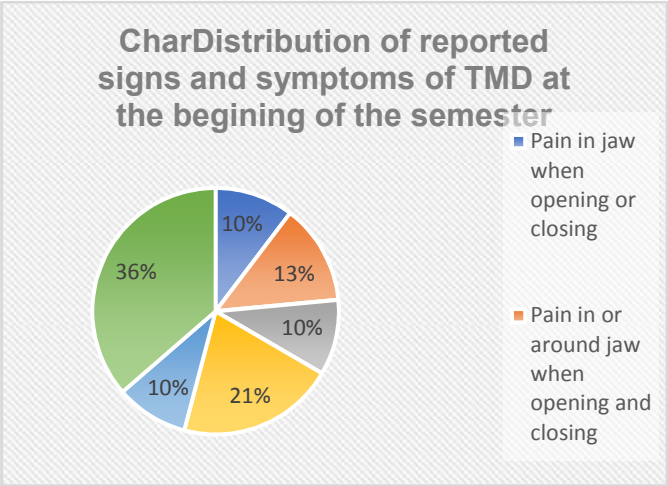

Figure 2. Distribution of reported signs and symptoms of TMD at the beginning of the semester

A total of 22 students reported conceiving a recent injury to the area of the head, neck or jaw and 13 students had reported seeking treatment for a jaw problem at the beginning of the semester and 5 had reported the same one week before the exam (Table 2, Figure 1 and 2). Table 3 shows the distribution of reported signs and symptoms of TMD at both occasions. Regarding signs and symptoms, headache prevalence was 32% at the beginning of the semester and become slightly higher one week before the exam with 36.7% of students reported headache. Joint noise reported by 18.2% of the students at the beginning of the semester and a slightly higher 20.4% at one week before the examination. Pain in or around the jaw was also found to have a significant presence among the study group at both times. Stress was seen to be significantly associated with many reported signs and symptoms of TMD reported at one week before exam such as pain in or around jaws when opening and closing mouth, joint noise, night PFH and day PFH (Table 4). Students who have never reported stress at any occasion seemingly had never reported any TMD's sign or symptom.

DISCUSSION

Temporomandibular disorders have a multifactorial Etiopathogenesis. Several authors underline the influence of local factors on their development, while others underline that of systemic factors. The importance of psychological factors, such as increased psycho-emotional activity and stress is also emphasized in literature describing the etiology of TMD and oral parafunctions (Manfredini and Lobbezoo, 1998). Stress is also an important factor contributing to the TMD development. The examined student population is particularly susceptible to the influence of this factor (Bonjardim *et al*., 2017). The period prior to the admission examination may generate severe psychological alterations in students, as shown in this study, because the examination is viewed as an obstacle for someone wishing to attain a university academic degree, in addition to the fact that adolescence is a period of turbulence during which the person undergoes changes and knows that he/she must take a decision that can change the course of his/her life. All of this is a major source of psychological disturbance during this stage (Manfredini and Lobbezoo, 2008). Stressors may include a large number of duties, the pressure of getting a good education, an uncertain future, low income, living far away from home, and functioning in an alien environment. Moreover, students also face social, emotional, physical and family problems (Dworkin, 2011). The aim of this study was to evaluate the relation of stress with the signs and symptoms of TMD in university students in King Khalid University through the distribution of frequency of data obtained from a questionnaire given to the students at two different stages of the academic year, that is, at the beginning of the semester (stage 1) and one week before the exam (stage 2). Over half of the students in this study (56% at stage 1 and 52.4% at stage 2) identified themselves as feeling stressed. According to current literature this percentage could reach 72% [6]or even 90%[7]in student population. It has also been proven that being under stress increases the activity of the masticatory muscles, which consequently results in TMD. The emotional influence on the mastication muscles has been studied. The reported conclusion was that when the individual is submitted to an emotional overload, teeth clenching may develop, producing circulatory changes in the mastication muscles or fluid increase in the muscular tissues with consequent compression of the pain receptors. In the present study, 48% of the males reported feeling stressed at stage one versus 64% of the females. At stage 2 all the males reported being stressed versus 12% of the females.

This can be attributed to several factors, with regard to stress, coping capacities may vary between the genders in different situations, and the response to the question regarding the feeling of stress may vary from person to person when put into different contexts that were not addressed in this questionnaire. Hence our results were not similar to other studies, and this discrepancy may also be due to different racial, cultural and economic environments. Genetic factors like gene variability, biological factors like diet, hormones, sleep, age, can also influence the adaptability to stress (LeResche, 1997). The students above the age of 20 have reported being more stressed than those below at both times i.e. 154 (57.5%) have reported being stressed. (p=0.005) which confirms that anxiety disorders affect the whole population and especially young people over 18 years of age. TMD symptomatology in students was marked by the predominance of headache (32% at stage one and 36.7% at stage 2) along with joint noise (stage 1 18.2% and stage 2 20.4%) and pain in and/or around the jaw joint (stage 1 11.6% and stage 2 12.4%). Similar findings were also reported by Diniz *et al*. and Bonjardim *et al*. (Manfredini and Lobbezoo, 2017) Who observed that the most prevalent subjective symptoms were joint sounds (26.72%) and headache (21.65%). Feteih reported similar results for adolescents in Saudi Arabia (Slade et al., 2017). Rosenblatt *et al*. found significant prevalence of myofascial pain and joint sounds in adolescents, with psychological components as potential risk factors for the worsening this symptomatology (Slade *et al*., 2016).

When testing the association between the feeling of stress and the TMD symptom, significant relationships were found of those who reported feeling stressed

- 15.4% had pain in jaw when opening or closing (p=0.007),
- 14.5% had pain in or around jaw when opening or closing (p=0.009)
- 23.9% reported joint noise (p=0.00)

The onset of TMD has been attributed to occlusal and joint alterations, and neuromuscular and psychological factors, with

the presence of two or three of these factors increasing the risk of developing TMD (Von Korff *et al*., 1993). Para functional oral habits like grinding and bruxing have been reported by many studies as aggravating factors that could lead to TMD, in this study many there is a significant reporting by the participants on clenching and grinding at night time (23.1%) and day time (33.8%) which is concomitant with stress (P=0.001). Only a small number of students have reported a head or neck injury (https://www.nidcr.nih.gov/About Us/ Councils/NADCRC/) which poses no significance to TMD causation, but what is alarming is that although several students did report TMD symptoms, only 5 have sought treatment for a jaw joint problem, which signifies the need for education and awareness programs for students to reduce the burden. The present study has limitations, as it was conducted for a small sample size, it does not confirm the absence or presence and degree of TMD, and also, the type of TMD was not clinically diagnosed. In addition, no imaging was used to confirm the diagnosis of TMD or simple pain. A follow-up with a clinical examination would have given more significant results.

Conclusion

The reported signs and symptoms slightly higher before exam than at the beginning of semester. Stress was seen to be significantly associated with signs and symptoms of TMD reported at one week before exam such as pain in or around jaws when opening and closing mouth, joint noise, night PFH and day PFH. Students who have never reported stress at any occasion seemingly had never reported any TMD's sign or symptom.

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