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RESEARCH ARTICLE

COMMON TEMPROMANDIBULAR JOINT DISORDERS SYMPTOMS AND THEIR ASSOCIATION WITH GENDER, BRUXISM AND LEVEL OF ANXIETY IN UNIVERSITY POPULATION

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ABSTRACT

Objectives: To investigate the common symptoms and severity of temporomandibular disorders (TMDs) in university students using Fonseca's questionnaire, to assess the association between self-reported questionnaire-based bruxism and TMD and to determine the relationship of TMD to age, gender, and different levels of anxiety.

Methods: Common TMD symptoms were diagnosed using Fonseca's 10 questions. Bruxism was diagnosed using self-reported questionnaire-based bruxism. The level of anxiety was measured using Trait Anxiety section of Spielberger State-Trait Anxiety Inventory (STAI-T).

Results: Out of 1100 questionnaires distributed, 745 completed questionnaires were received (response rate: 67.7%). Mean age was 21.62 ± 1.77. TMD was observed in 270 (44%) students. The most common symptoms of TMD were: have frequent headaches (53%), get tired/muscular pain while chewing (36%), and TMJ clicking while chewing or when they open their mouth (34%). The association between age and gender with TMD was not significant ($p>0.1$ and $p>0.3$ respectively). However, the association between bruxism habits and TMD levels revealed a statistically significant difference ($p<0.000$). Moreover, students with high level of anxiety had a 2.8 higher probability of developing TMD (95% CI: 0.3-26.7; $P> 0.4$).

Conclusion: This study revealed a higher prevalence of TMD among college students, and described a strong relationship between this disorder and the levels of anxiety. Female students, older students, those with bruxism habits, and who considered anxious are more likely to develop TMD.

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INTRODUCTION

Tempromandibular disorder (TMDs) is a musculoskeletal disorder which describes many clinical problems involving tempromandibular joint (TMJ), masticatory muscles, and associated structures or both (Leresche, 1997). The etiology of TMD is multifactorial and it is related to a group of functional, structural and psychological factors. However, the major etiologic factors associated with TMD as revealed by previous studies are occlusal disturbances, psychosocial factors, and parafunctional habits (deSantis *et al*., 2014; Manfredini and Lobbezoo, 2010; Smriti *et al*., 2014). Parafunctional habits such as bruxism or gum chewing could be one of the reasons that aggregate the TMD and these habits are usually developed by emotional stress (Magnusson *et al*., 2005; Roda *et al*., 2007; Roda *et al*., 2012). Consequently, psychosocial factors such as anxiety, stress, and depression are highly associated with the TMD (Minghella *al*., 2014).

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The signs and symptoms of TMD as suggested by American Dental Association is characterized by pain in the temporomandibular joint (TMJ), the periauricular area, or the muscles of mastication; TMJ noises (sounds) during mandibular function; and deviations or restriction in mandibular range of motion (Laskin *et al*., 1983). A high prevalence of TMD was found in the general populations (Majumdar *et al*., 2015; Minghella's *al*., 2014; Zwiri and Al-Omiri, 2015). Several studies indicated that approximately 60-70% of the population has at least one sign of TMD at some point in their life (Roda *et al*., 2007; Roda *et al*., 2012). The signs and symptoms were also reported in nearly 6% to 68% of children (Leresche, 1997; Magnusson *et al*., 1985; Feteih, 2006). However, the differences in the sampling design, criteria, and methods used for diagnosing the disorder play an important role in the different TMD prevalence results (Modi *et al*., 2012). There are various instruments for the assessment of TMD, including indices, questionnaires, protocols, rating scales, and diagnostic criteria. Of these, questionnaires have the advantage of low cost, ease of use, and fast for the

epidemiological survey. Therefore, Fonseca (1992) developed his anamnestic questions that classify TMD signs and symptoms as free, mild, moderate or severe TMD. Fonseca has developed his questions to simplify the epidemiologic studies and it covers major signs and symptoms of TMD. Other advantages of Fonseca questions are self-administration and short-time of application. Thus, it would provide information for the early diagnosis of TMDs (Campos *et al*., 2009; de Oliveira *et al*., 2006; Chaves *et al*., 2008). Temporomandibular disorders observed among older individuals and its increased with age and TMD were reported to be two times more common in woman than in men (Bonjardim *et al*., 2009; de Oliveira *et al*., 2006; Syed *et al*., 2012). Women also seek specialized treatment for this disorder three times more frequently than in men (Fischer *et al*., 2007). A further important factor in the development of TMD is bruxism. It is commonly considered the most detrimental to all the parafunctional activities of the stomatognathic system and a major risk factor for temporomandibular disorders (Svensson *et al*., 2008). The American Academy of Orofacial Pain defines bruxism as a parafunctional diurnal or nocturnal activity which includes both tooth grinding and clenching (American Academy of Orofacial Pain, 1996). Bruxism showed a positive association with the TMD' signs and symptoms, it increases the development of the TMD by inducing prolonged stimuli and activation of mechanical and neuromuscular activity of the masticatory system (Magnusson *et al*., 2005; Schierz *et al*., 2007). Psychosocial factors also play an important role in the pathogenesis of TMD. Anxiety is most frequently reported among university students due to the academic stress (Bonjardim *et al*., 2009). High levels of anxiety and stress-related symptoms have been reported in TMD patients (Minghelli *et al*., 2014; Vasudeva *et al*., 2014). The psychosocial factors have shown to influence the treatment outcome among TMD patients (Ferreira *et al*., 2009). This led to include the psychological component to a multidisciplinary management of TMD (Ozdemir-Karatas *et al*., 2013). However, the prevalence of TMD among health sciences students at Qassim regions are still not well documented; therefore, studies are crucial to identifying the prevalence of this disorder as it affects many university students who are unaware of their diagnosis. Thus, the aim of this study was to assess the common symptoms and severity of temporomandibular disorders (TMDs) in university students using Fonseca's questionnaire, to assess the association between self-reported questionnaire-based bruxism and TMD and to determine the relationship of TMD to age, gender, and different levels of anxiety.

MATERIALS AND METHODS

Study design and setting

A cross-sectional questionnaire-based study was carried out. Ethical approvals were obtained from ethical committee at Dental Research Centre (DRC), college of dentistry, Qassim University. The study involved students (of both sexes) from the Colleges of Medicine, Dentistry, Pharmacy, Applied Medical Sciences and Nursing at Qassim University. The inclusion criteria for this study were any healthy science student who is Saudi citizens and wants to participate on the day of the study. Those who have a history of TMJ trauma, receiving orthodontic treatment or treatment for TMD, suffering from any immunocompromised disease and/or willingness to participate in the study were excluded (Hiz *et al*., 2012). An introductory note was added in the questionnaire to inform the students about the purpose of the study and to ensure them about the confidentiality of data they will provide.

Data collection methods

The questionnaire was distributed to those present on the day of the study. The questionnaire comprised two main parts. The first part collected demographic information and past medical, dental, and TMJ histories. The second part asked about Fonseca's 10 questions regarding common TMD symptoms.
The Fonseca Anamnestic Questionnaire obtained a 95% correlation with the clinical Helkimo index (r = 0.6169, $p<0.05$), and 95% reliability in the application (Da Fonseca *et al*., 1994). Participants were requested to select one answer: yes, no, or sometimes. Each ''yes'' answer was assigned a value of 10, each ''sometimes'' answers a value of 5, and each ''no'' answer a value of 0. The sum of the values for all 10 answers will be used to classify each subject according to the criteria; free of TMD (score b/w 0–15), mild TMD (score b/w 20–40), moderate TMD (score b/w 45–65), and severe TMD (score b/w 70–100). Bruxism was diagnosed using self-reported questionnaire-based bruxism that was adapted from the previous study (Paesani *et al*., 2013). The questionnaire investigating five bruxism-related items 'i.e. sleep grinding, sleep grinding referral by a bed partner, sleep clenching, awake clenching, awake grinding'.

In addition, the level of anxiety was measured by Trait Anxiety section of Spielberger State-Trait Anxiety Inventory (STAI-T), to evaluate the students 'trait anxiety, which was developed, by Spielberger in 1989. This scale contained 20 questions and the respondents were oriented to rate themselves on each item on how "they feel in general" according to a 4-point Likert scale: 1 – almost never; 2 – sometimes; 3 – often; 4 – almost always. The score of each answer would be from 1 to 4, obtaining a final score. For assessment of the results, the following criteria were considered: 20 to 40 = low level of anxiety; 41 to 60 = moderate level of anxiety; 61 to 80 = high level of anxiety (Spielberger, 1989).

Data analysis

All data were managed and statistically analyzed using SPSS (Statistical Package for the Social Sciences) software version 21 (SPSS Inc., Chicago, IL, US). Descriptive statistics were made to all variables in the study. In order to evaluate the associations between the occurrence of TMD and gender, age group, bruxism habits and anxiety levels, Chi-squared Test of Independence was applied. The effect of the variables used in this study with the presence of TMD was assessed using binary logistic regressions. The models Enter e Forward LR and the Omnibus, Hosmer, Lemeshow, and Nagelkerke tests were used. The models' results were presented as crude and adjusted Odds Ratios (OR) and 95% confidence intervals (CI) were calculated. The margin of error for interpretation of the statistical tests was set at $p<0.05$.

RESULTS

Out of 1100 questionnaires distributed, 745 completed questionnaires were received (response rate: 67.7%). Out of these 745 participants, 131 questionnaires were excluded based on the exclusion criteria. A total of 614 respondents were included in the present study. Two hundred and eighty students (45.6%) were from College of Medicine, 132 (21.5%) from College of Dentistry, 130 (21.2%) from College of Pharmacy, 46 (7.5%) from College of Nursing, and 26 (4.3%) from the College of Applied Medical Sciences. The mean age of participants was 21.62 ± 1.77. The Fonseca anamnestic index result showed that 270 (44%) students have at least one symptoms of TMD. However, only 2.3% of the students have severe dysfunction. Table 1 shows the absolute and relative frequencies of answers to the Fonseca Anamnestic Questionnaire. The most common symptoms of TMD (summing the answers YES and SOMETIMES) were the following: have frequent headaches (53%), get tired/muscular pain while chewing (36%), and TMJ clicking (or noises) while chewing or when they open their mouth (34%; Table 1). A total of 344 (56%) students did not have TMD and 270 (44%) had TMD; moreover, 188 (30.6%) students presented with mild TMD, 68 (11.1%) had moderate, and 14 (2.3%) had severe TMD.

The mean age of the students with severe dysfunction was greater as compared to other groups (22.64 ± 2.59). However, there was no statistical difference when we compared the age of the students who are free of TMD with those of TMD (Table 2). Gender and TMD results showed that 44% of the students who had TMD, 33.1% were females and only 10.9% were males The association between gender and TMD showed no significant difference between males and females in the TMD degree (p= 0.3; Table 3) The majority of the students with TMD diagnosed themselves to have sleep clenching (76.9%) followed by sleep grinding referral (71.6%) and sleep grinding (67.5%). Moreover, 52 (37.4%) of the students with free TMD have diagnosed to have awake clenching habit. However, sleep grinding referral was common in the students with moderate to severe dysfunction of the TMD (40.3%). The association between habits and TMD degree revealed a statistically significant difference (p<.000; Table 4). The association between anxiety and TMD revealed that students with free TMD had a low level of anxiety (67.2%) compared to the students with TMD (32.8%). Moreover, Moderate and high level of anxiety were greater in students with TMD (52.2% and 75% respectively). The mean score of anxiety gradually increased from students with free of TMD (39.94± 6.99) to the highest mean with the students with severe dysfunction (48± 5.7).

Table 1. Participants Response to Fonseca's 10 questions (n =614)

Questions	Yes n (%)	Sometimes n (%)	No n (%)
Is it hard for you to open your mouth?	32 (5.2)	94 (15.3)	488 (79.5)
Is it hard for you to move your mandible from side to side?	28 (4.6)	73 (11.9)	513 (83.6)
Do you get tired/muscular pain while chewing?	53 (8.6)	168 (27.4)	393 (64)
Do you have frequent headaches?	98 (16)	227 (37)	289 (47.1)
Do you have pain on the nape or stiff neck?	40 (6.5)	135 (22)	439 (71.5)
Do you have ear pain or pain in the region of tempromandibular joints (TMJ)?	50 (8.1)	118 (19.2)	446 (72.6)
Have you noticed any TMJ clicking (or noises) while chewing or when you open your mouth?	61 (9.9)	148 (24.1)	405 (66)
Do you use only one side of your mouth when chewing?	119 (19.4)	182 (29.6)	313 (51)
Do you feel your bite 'abnormal'?	56 (9.1)	90 (14.7)	468 (76.2)
Do you have morning facial pain?	24 (3.9)	58 (9.4)	532 (86.6)

Table 2. Classification of severity of temporomandibular disorders (n= 614)

TMD degree	*n* (%)	Mean age± SD	95% Confidence interval		Minimum	Maximum
			Lower bound	Upper bound		
Free of TMD	344 (56)	21.63 ± 1.69	21.45	21.81	18	29
Mild	188 (30.6)	21.59 ± 1.58	21.36	21.81	18	25
Moderate	68 (11.1)	21.43 ± 2.35	20.86	21.99	19	32
Severe	14 (2.3)	22.64 ± 2.59	21.15	24.14	20	29
Total	614	21.62 ± 1.77	21.48	21.76	18	32

ANOVA: F= 1.9,p=0.1

Table 3. Association of gender with TMD degree

Gender	Tempromandibular disorders				*p* value[a]
	Absence n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	
Male	93 (58.1)	50 (31.3)	12 (7.5)	5 (3.1)	3.4 (.338)*
Female	251 (55.3)	138 (30.4)	56 (12.3)	9 (2)	
Total	344 (56)	188 (30.6)	68 (11.1)	14 (2.3)	

[a]Chi-squared Independence Tests
*Significant at p<0.05

Table 4. Association of bruxism with TMD degree

Items		Tempromandibular disorders				*p* value[a]
		Absence n (%)	**Mild** n (%)	**Moderate** n (%)	**Severe** n (%)	
Sleep grinding	Yes	50 (32.5)	60 (39)	37 (24)	7 (4.5)	60.8 (.000)*
	No	294 (63.9)	128 (27.8)	31 (6.7)	7 (1.5)	
Sleep grinding referral	Yes	19 (28.4)	21 (31.3)	23 (34.3)	4 (6)	51.5 (.000)*
	No	325 (59.4)	167 (30.5)	45 (8.2)	10 (1.8)	
Sleep clenching	Yes	9 (23.1)	17 (43.6)	10 (25.6)	3 (7.7)	23.7 (.000)*
	No	335 (58.3)	171 (29.7)	58 (10.1)	11 (1.9)	
Awake clenching	Yes	52 (37.4)	49 (35.3)	26 (18.7)	12 (8.6)	53.6 (.000)*
	No	292 (61.5)	139 (29.3)	42 (8.8)	2 (.4)	
Awake grinding	Yes	26 (34.2)	24 (31.6)	19 (25)	7 (9.2)	40.9 (.000)*
	No	318 (59.1)	164 (30.5)	49 (9.1)	7 (1.3)	

[a]Chi-squared Independence Tests
*Significant at $p<0.05$

Table 5. Association of anxiety with TMD degree

Level of anxiety	Tempromandibular disorders				*p* value[a]
	Absence n (%)	**Mild** n (%)	**Moderate** n (%)	**Severe** n (%)	
Low	178 (67.2)	69 (26)	16 (6)	2 (0.8)	38.1 (.000)*
Moderate	165 (47.8)	118 (34.2)	51 (14.8)	11 (3.2)	
Severe	1 (25)	1 (25)	1 (25)	1 (25)	
Total	344 (56)	188 (30.6)	68 (11.1)	14 (2.3)	

[a]Chi-squared Independence Tests
*Significant at $p<0.05$

Table 6. Association of anxiety score with TMD degree

TMD degree	*n* (%)	Mean score ± SD	95% Confidence interval for mean		Minimum	Maximum
			Lower bound	Upper bound		
Free of TMD	344 (56)	39.94 ± 6.99	39.20	40.68	22	63
Mild	188 (30.6)	42.64 ± 7.01	41.64	43.65	26	61
Moderate	68 (11.1)	44.97 ± 6.81	43.32	46.62	28	66
Severe	14 (2.3)	48.00 ± 5.7	44.71	51.29	39	62
Total	614	41.51 ± 7.22	40.94	42.08	22	66

ANOVA: $F= 17.21, p<.000$

Table 7. Results of binary logistic regression for the presence of TMD

Variables	Odds ratio (CI 95%); *p*-value
Age group (18-22 years*) 23-27 years	**.959 (.672-1.4); 0.8**
Age group (23-27 years*) 28-32 years	**1.9 (.323-12.15); 0.5**
Gender (female*) Male	**.89 (.62-1.3); 0.5**
Sleep grinding (Absence *) presence	**3.7 (2.5-5.4); .000**
Sleep grinding referral (Absence *) presence	**3.7 (2.1-6.4); .000**
Sleep clenching (Absence *) presence	**4.6 (2.2-9.9); .000**
Awake clenching (Absence *) presence	**2.7 (1.8-3.9); .000**
Awake grinding (Absence *) presence	**2.8 (1.7-4.6); .000**
Anxiety (low*) moderate	**2.2 (1.6-3.1); .000**
Anxiety (moderate*) high	**2.8 (.3-26.7); 0.4**

*Class reference

There was statistically significant difference in the level of anxiety associated with TMD degree ($p<.000$; Table 5 and 6). Table 7 shows the results of binary logistic regression analysis of the presence of TMD. The data revealed that students in the older age group (28-32 years) had 1.9 (95% CI: 0.323-12.15; $P= 0.5$) higher probability of developing TMD. Males were less likely to have TMD than females; OR= 0.9 (95% CI: 0.62-1.3; $P= 0.5$). Moreover, the odds of having TMD were significantly greater among subjects with bruxism habits compared to those without bruxism. Regarding the anxiety levels, students with a moderate level of anxiety had 2.2 (95% CI: 1.6-3.1; $P < 0.000$) higher probability, and those with a high level of anxiety were more likely to had TMD; OR= 2.8 (95% CI: 0.3-26.7; $P= 0.4$). In the adjusted model, the values obtained in the Omnibus, Hosmer-Lemeshow, and Nagelkerke tests were respectively $p= 0.000$, $p= 0.419$, $R^2= 0.202$ being considered mathematically valid models to perform the analysis (applied to the characteristics of the sub-sample absence and presence of TMD adjusted for the age group, gender, bruxism habits and anxiety levels).

DISCUSSION

The present study assesses the common symptoms of TMD and its relation to age, gender, bruxism and different levels of anxiety among health sciences students at Qassim University. The self-applied questionnaire was used for data collection. The Fonseca Anamnestic index used to classify TMD degree provided substantial information for early diagnosis in a short time of application and low cost.In this study, 270 (44%) students have at least one symptoms of TMD. Minghelli *et al*. (2014) and Habib *et al*. (2014) found aTMD prevalence similar to that in the present study (42.4% and 46.8% respectively). However, other studies, which used the same instrument to measure TMD prevalence, reported even higher values. Bezerra *et al*. (2012) found that 62.5% had some degree of TMD. Among all relevant studies, de Oliveira *et al*. (2006) evaluated 15 Brazilian cities, and the prevalence of TMD was 68.6%. Regarding severity, out of 270 who had TMD, 188 (30.6%) presented with a mild degree, 68 (11.1%) had moderate, and only 14 (2.3%) had severe TMD. Previous studies also reported that mild TMD degree was the most prevalent category (Smriti *et al*., 2014; Modi *et al*., 2012; Habib *et al*., 2014; Ryalat *et al*., 2009). The most common symptoms of TMD were the following: have frequent headaches (53%), get tired/muscular pain while chewing (36%), and TMJ clicking (or noises) while chewing or when they open their mouth (34%). These findings are similar to those of Minghelli *et al*. (2014) who found that 85.5% of students considered themselves tense people, 75.4% had a frequent headache, 66.5% had neck pain, and 53.9% had TMJ noise while chewing or opening the mouth. Bezerra *et al*. (2012) observed that a frequent headache is one of the commonest symptoms (45.2%). Even in children, Feteih (2006) reported that a headache was the highest prevalent symptom followed by pain during chewing. The possible explanation for the relation between a headache and TMD is that a headache is usually related to muscle activity; thus, activities involving the head and neck play an important role in the etiology of many headaches (Poveda *et al*., 2007). Liljeström *et al*. (2005) observed the association of TMD and headache in a group of adolescents with a primary headache and they reported that if the headaches are associated with other symptoms such as ear pain, difficulty in mouth opening, fatigue or stiffness of the jaw, and tenderness of masticatory muscles, TMD should always be considered. However, the presence of a headache could also have causes other than the hyperactivity of the muscles of the temporomandibular region. The presence of noise in TMJ may be due to changing in the positioning of the articular cartilage, which displaces the mandibular condyle superiorly when the mouth is opened, resulting in a click (Poveda *et al*., 2007).

The present study revealed that females had a higher degree of TMD signs and symptoms (44.7%) than that of males (41.9%), but the difference was not significant. Similar results were found with Oliveira *et al*. (2006), females exhibited some TMD degree (73.03%) with a greater frequency than males (56.26%). Minghelli *et al*. (2014) reported that 25.2% of his sample study had some degree of TMD signs and symptoms, out of which 61.5% of them were females with no significant difference between the two groups. These findings are in accordance with the results of other studies conducted in different populations (Syed *et al*., 2012; Smriti *et al*., 2014; Ryalat *et al*., 2009). There are some explanations for the greater prevalence of TMD in females; LeResche *et al*. (1997) found that the pain threshold in women was influenced by the hormonal changes and the estrogen levels during the menstrual cycles. The presence of estrogen receptors in women's TMJ changes metabolic functions increasing ligament laxity and painful stimuli by modulating the limbic system. In addition, Sipila *et al*. (2001) reported that women mostly had more depressive episodes than men. Other authors have related that women usually answer positively to a greater number of questions because they are more careful to their health status than men (Agerberg and Carlsson, 1973). However, despite all these theories the main reason of why females had a higher prevalence of TMD than males remains unknown and needs further studies (Syed *et al*., 2012; Smriti *et al*., 2014; Minghelli *et al*., 2014; Ryalat., 2009).The results of this study indicated the mean age of the students with severe dysfunction was greater as compared to other groups (22.64 ± 2.59). However, age variations within the investigated students sample had no significant effect on the TMD symptoms. This was in agreement with the previous studies (Habib *et al*., 2014; Ryalat *et al*., 2009). However, other studies reported either an increase in symptoms with age (Nilsson *et al*., 2007) or a decrease with age (Salonen *et al*., 1990).

It was observed from the present study that the majority of the students with TMD have diagnosed themselves to have parafunctional habits. Sleep clenching (76.9%) followed by sleep grinding referral (71.6%) and sleep grinding (67.5%) were the highest among TMD students. Moreover, 52 (37.4%) of the students with free TMD have diagnosed to have awake clenching habit. However, sleep grinding referral was common to the students with moderate to severe dysfunction of the TMD. The association between these habits and TMD degree revealed a statistically significant difference ($p<.000$). This is similar to a study by Miyake *et al*. (2004) which concluded that the risk factors for TMD were bruxism and chewing gum on one side. A significant correlation between bruxism and TMD was reported on a longitudinal study over a period of 20 years (Magnusson *et al*., 2005). Recently, Kasab *et al*. (2015) found that the oral parafunctional habits were predisposed factors in the development of TMD and were reported in more than half of the positive cases of the TMD. Various authors reported that the theory of the association between bruxism and TMD symptoms is based on the repeated overuse of TMJ which leads to functional abnormalities. Others suggested that bruxism might be related to deterioration of the TMJ and therefore the greater the number of parafunctional habits, the higher the risk of condylar bony change and articular cartilage degradation (Schierz *et al*., 2007; Chuang, 2002).In addition, students with free of TMD had a low level of anxiety (67.2%) compared to the students with TMD (32.8%). Moreover, moderate and high level of anxiety was greater in students with TMD (52.2% and 75% respectively). Students with a high level of anxiety had an OR of 2.8 (95% CI: 0.3-26.7; $P= 0.4$) higher probability of developing TMD. The relationship between the psychological factors and TMD has been extensively studied. The results of this study were in agreement with previous studies. For instance, Vasudevan

et al. (2014) assessed the correlation of anxiety levels between temporomandibular disorder patients and normal subjects, they reported that greater number of subjects without any signs and symptoms of TMD came under normal anxiety levels in comparison with subjects affected with TMD. Moreover, abnormal anxiety scores were significantly more in subjects with TMD in comparison to those without signs and symptoms of TMD. Similar results also reported in a study done on the college students, it was observed a higher prevalence of moderate/high level of anxiety for TMD individuals (65.6%) compared to the TMD-free individuals (34.4%) (Bezerra *et al*., 2012). Minghelli *et al*. (2014) found that students with anxiety or depression had an OR of 3.1 (95% CI: 2.42-3.84; $P < 0.001$) for TMD, as compared with students without these symptoms.

Recently the association between psychological factors and different signs and symptoms of TMD is widely acknowledged, but there is less evidence that these are etiologic factors. Usually, stress and anxiety may induce muscle hyperactivity and muscle fatigue which leads to muscle spasms. These factors can alter the occlusal scheme of the masticatory cycle so that these alterations are more a result of TMD and not a triggering factor. Individuals subject to stress may develop parafunctional habits and these leads to muscle tension, which in turn induce the development of TMD. Thus, parafunctional components, especially those that increase masticatory muscle tension, and cause changes in emotional states are main indicators of jaw pain in people with TMD (Minghelli *et al*., 2014; Vasudeva *et al*., 2014; Poveda *et al*., 2007; Ferrando *et al*., 2004).

However, the present study has some limitations. A questionnaire was used to classify TMD. More-detailed questionnaires for assessing the presence of TMD or clinical examination of TMD signs and symptoms and imaging tests to confirm the diagnosis would have been more useful. Furthermore, we did not confirm the diagnoses of the presence of bruxism clinically. We opted to use the Fonseca Anamnestic Questionnaire and self-reported questionnaire-based bruxism because this study was a cross-sectional epidemiological study of a large sample. The use of a simple, inexpensive questionnaire allowed for the rapid collection of information that helps for early diagnosis. Another limitation was the lower response of male students. Nevertheless, this study is one of the very few studies that provided some information regarding the common symptoms and severity of TMDs in Saudi students. Early diagnosis and a multidisciplinary management of the TMD are of considerable importance. Increasing awareness of TMD signs and symptoms among college students as those students exposed to higher levels of stress. Future studies are needed including a sample from other regions of the country in order to be aware of this disorder on the national level.

Conclusion

This study revealed a higher prevalence of TMD among college students and described a strong relationship between this dysfunction with the levels of anxiety. Female students, older students, those with bruxism habits, and who considered anxious are more likely to develop TMD.

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