ORIGINAL ARTICLE

Prevalence and severity of temporomandibular disorders among university students in Riyadh

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Abstract *Objective:* The aim of this study was to evaluate the prevalence and severity of temporomandibular disorders (TMDs) among male university students in Riyadh, Saudi Arabia. The role of relevant medical and dental histories in the assessment of TMD in this Arab population was also addressed.

Methods: Required information was collected via a questionnaire. The first part of the questionnaire was used to obtain the medical and dental histories of participants. The second part included 10 questions regarding common TMD symptoms. Fonseca's anamnestic index (FAI) was used to classify TMD severity as "no dysfunction", "light dysfunction", "moderate dysfunction", or "severe dysfunction".

Results: Of the 600 distributed questionnaires, 400 questionnaires were completed (response rate: 66.6%). Mean age of eligible participants was 21.90 ± 1.79 years. Psychological stress (30.5%) and direct restorations (77%) were the most commonly reported items on the medical and dental histories respectively for the total number of participants. According to the FAI, 53.2% of participants were classified as having no dysfunction, followed by light (36.1%), moderate (9.6%), and severe dysfunction (1.1%).

Conclusions: Based on the FAI, mild to moderate prevalence of TMD appears to exist among male university students in Riyadh. Histories of psychological stress and dental treatment were

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evident among these students. Information obtained from the FAI may be helpful in assessing the prevalence of TMD and has important implications for the early diagnosis of TMD and the prevention of future TMD-related complications.

1. Introduction

Temporomandibular disorders (TMDs) is a collective term that defines a subgroup of painful orofacial disorders, involving complaints of pain in the temporomandibular joint (TMJ) region, fatigue of the cranio cervico facial muscles (especially masticatory muscles), limitation of mandible movement, and the presence of articular clicking. The etiology of TMDs has been linked to multiple factors, including traumatic injury, immune-mediated systemic disease, neoplastic growths, emotional stress, occlusal interferences, mal positioning or loss of teeth, postural changes, dysfunctions of the masticatory musculature and adjacent structures, extrinsic and intrinsic changes of TMJ structure, nonfunctional movements of the mandible (bruxing), tooth clenching habits, or a combination of such factors (deSantis et al., 2014; Manfredini and Lobbezoo, 2010; Bonjardim et al., 2005a,b). Prosthodontic rehabilitation, orthodontic treatment, orthognathic surgery, and mandibular fractures have been associated with TMJ changes and worsening of existing TMD (Goldstein, 1999). Loading, altered jaw position, and mechanical stress in response to the aforementioned treatments induce morphological changes in the TMJ, due to its inherent adaptive capacity (Arnett et al., 1996).

The prevalence of TMDs ranges from 20% to 50%. The variability in prevalence may be attributed to differences in the race of the population, in the sampling design and criteria, and in the methods used for collecting information (Lee et al., 2013; Modi et al., 2012; Ebrahimi et al., 2011; Vojdani et al., 2012; Nomura et al., 2007; de Oliveira et al., 2006; Feteih, 2006; Farsi, 2003). Screening for TMDs in a population is a challenge for researchers and clinicians, and several TMD assessment tools have been proposed in the literature. However, no universal diagnostic criteria have yet been established. In response to this need for a universally accepted TMD assessment tool, Dworkin and Leresche (1992) proposed the RDC/TMDs, which have since been used in several clinical and epidemiological studies. Most recently, Schiffman and colleagues (2014) proposed a new comprehensive version of the RDC/TMDs, known as the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). They claim that the DC/TMD includes a valid and reliable screening questionnaire, as well as diagnostic algorithms for the most common pain-related TMDs. Despite their advantages, the RDC/TMD and DC/TMD are quite cumbersome assessment tools in that they require the individual to be present in order to render a TMD diagnosis, and they are difficult to use on large samples.

A self-administered questionnaire that includes the Fonseca's anamnestic index (FAI) has been proposed as a low-cost, easily applied alternative TMD assessment tool for the non-patient population (Da Fonseca et al., 1994). The use of FAI for detecting TMD signs and symptoms offers the advantage of being easily used by either general practitioners or epidemiologists. Thus, the FAI would serve as a preliminary TMD screening tool. After the affected population is identified, a more thorough investigation can be conducted, which would include a complete clinical examination and use of diagnostic instruments to confirm the diagnosis. In a literature review regarding the reliability of using a questionnaire for assessing the severity of TMDs, Campos and colleagues (2009) recommended the use of FAI because of its simplicity, speed, and cost effectiveness. The questionnaire also provides a severity index with less influence from the examiner and less variability in the measures (Nomura et al., 2007; de Oliveira et al., 2006). Fonseca's questionnaire follows the characteristics of a multidimensional evaluation. It is composed of 10 questions that screen for the presence of pain in the TMJ, head, and back; pain while chewing; parafunctional habits; movement limitations; joint clicking; perception of malocclusion; and sensation of emotional stress (Da Fonseca et al., 1994).

Psychological factors are known to play a role in the etiology and persistence of TMDs. In particular, a high incidence of exposure to stressful life events and elevated levels of anxiety and stress-related symptoms have been reported in TMD patients (Pesqueira et al., 2010; Pallegama et al., 2005). Anxiety and depression are the most frequent clinical disorders in the general population and are highly present among university students. The repercussions of academic stress on the health of university students have been reported in the literature (Bonjardim et al., 2009). The university setting provides an ideal context for studying the mental health of young adults. University students are often undergoing role transitions, such as moving away from the family home for the first time, residing with other students, and experiencing reduced adult supervision. These changes may increase the risk of depression (Bonjardim et al., 2009; Pesqueira et al., 2010).

The aim of this study was to use a cross-sectional epidemiological survey to investigate the prevalence and severity of TMDs in male Saudi university students using Fonseca's questionnaire. The role of relevant medical and dental histories in the assessment of TMD was also investigated. We hypothesized that using the FAI to characterize TMJ dysfunction would be helpful in furthering the understanding of TMD prevalence among Saudi university students and would provide information important for the early diagnosis and management of TMDs.

2. Methods

2.1. Study design

This descriptive cross-sectional research project was approved by the Ethics Committee of the College of Dentistry Research Center, King Saud University, Riyadh. The study was carried out between September 2013 and March 2014. Required

information was collected via an anonymous questionnaire that was adopted from previous studies (Modi et al., 2012; Ebrahimi et al., 2011; Vojdani et al., 2012; Nomura et al., 2007; de Oliveira et al., 2006; Feteih, 2006; Farsi, 2003) and modified to suit the requirements of our study. An Arabic translation of the questionnaire was provided to students who could not read English. Questionnaires and a cover letter stating the instructions, rationale, and purpose of the survey were distributed to a conveniently selected sample of 600 male university students from the Colleges of Medicine, Dentistry, Pharmacy, Applied Medical Sciences and Engineering at King Saud University, Riyadh, Saudi Arabia. Students who were willing to participate in the study filled the questionnaire by hand and returned it in person. Participants were not given a time limit for completing the questionnaire.

2.2. Questionnaire

The questionnaire comprised two main parts. The first part collected demographic information and past medical, dental, TMJ, and facial trauma histories. The second part asked Fonseca's 10 questions (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" answer a value of 5, and each "no" answer a value of 0. The sum of the values for all 10 answers was used to classify each subject according to the criteria shown in Table 1. Participants having a history of TMJ trauma, receiving orthodontic treatment or treatment for TMD, and/or suffering from any immunocompromised disease were excluded from the study (Hiz et al., 2012).

2.3. Statistical analysis

Descriptive statistics and frequency analyses of the collected data were performed in the Statistical Package for Social Sciences (SPSS) software (version 17 SPSS, Chicago, Illinois, USA). Age of the participants was expressed as the mean ± standard deviation (SD), and 95% confidence intervals were reported. Chi-square tests for statistical significance were applied to the frequencies within each Fonseca's severity category and to the frequencies of responses to each Fonseca's question, with $p < 0.05$ regarded as statistically significant.

3. Results

Of 600 questionnaires distributed, 400 completed questionnaires were received (response rate: 66.6%).Of these 400 respondents, 120 (20%) were excluded from the study based on the aforementioned criteria, leaving a total of 280 (46.66%) participants for the analysis. Eligible respondents included 141 (50.5%) from the College of Dentistry, 56 (20%) from the College of Medicine, 31 (11.25%) from the College of Pharmacy, 30 (9.25%) from the College of Engineering, and 25 (9%) from the College of Applied Medical Sciences. The mean age of participants was 21.90 ± 1.79 years.

The medical, dental, and TMJ histories of all the 400 participants are presented in Table 2. With respect to past medical history, 30.5% of participants reported a history of psychological stress. Over three-fourths (77%) of participants reported a history of dental fillings. Whereas 67 participants (16.8%) reported a history of TMD, only 2 of them (0.5%) had received treatment for it.

The number and percentage of participants with different levels of TMJ dysfunction based on the FAI are presented in Table 3 and Fig. 1. Almost half of participants (53.2%) were classified as having no dysfunction, whereas only 1.1% was classified as having severe dysfunction. There was no significant difference in the mean age of participants among the Fonseca's severity categories.

The frequencies of the participants in Fonseca's severity categories with respect to past medical and dental histories are listed in Table 4. Most participants who reported a history of psychological stress (42.2%), teeth extraction (45.67%), and dentures (66.66%) were classified by the FAI as having light dysfunction. Participants with a history of crowns and bridges were classified equally as having no dysfunction (29.72%) or light dysfunction (43.24%) for each category.

Table 1 TMDs severity classification based on Fonseca's anamnestic index.

Without dysfunction	Score b/w 0–15
With light dysfunction	Score b/w 20–40
With moderate dysfunction	Score b/w 45–65
With severe dysfunction	Score b/w 70–100

Table 2 Medical, dental and TMJ history of all the participants ($N = 400$).

Medical history of concern			
Psychological stress	Arthritis	Musculoskeletal disorder	Neurological disorders
122 (30.5%)	4 (1%)	11 (2.8%)	7 (1.8%)

Dental history of concern					
Orthodontic treatment	Crowns and bridges	Dentures	Teeth extraction	Fillings	Root canal treatment
117 (29.3%)	45 (11.3%)	4 (1%)	145 (36.3%)	308 (77%)	100 (25%)

TMJ history of concern		
Presence of TMD	Treatment received for TMD	History of trauma to the face
67 (16.8%)	2 (.5%)	17 (4.2%)

Table 3 Classification of severity of temporomandibular disorders based on Fonseca's anamnestic index ($N = 280$).

Fonseca's classification	N (%)	Mean age ± SD	95% Confidence interval for mean		Minimum	Maximum
			Lower bound	Upper bound		
Without dysfunction	149 (53.2)	21.84 ± 1.78	21.53	22.16	19.00	27.00
With light dysfunction	101 (36.1)	21.76 ± 1.85	21.34	22.17	19.00	26.00
With moderate dysfunction	27 (9.6)	22.55 ± 1.57	21.81	23.28	20.00	25.00
With severe dysfunction	3 (1.1)	23.66 ± .57	22.23	25.10	23.00	24.00
Total	280	21.90 ± 1.79	21.66	22.17	19.00	27.00
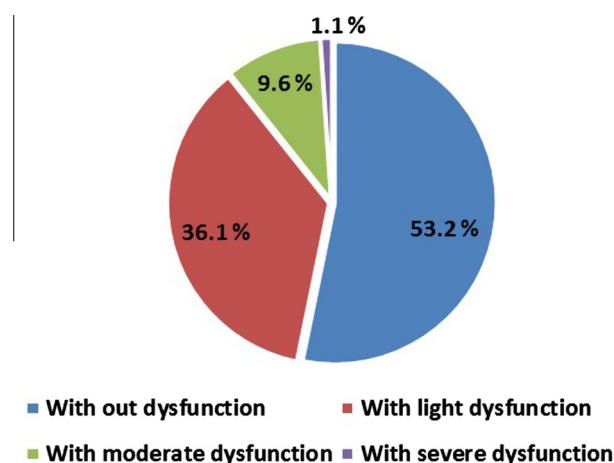
Figure 1 Classification on the basis of severity of TMDs ($n = 400$).

The majority of participants in the moderate dysfunction category had a history of dental fillings (10.90%), teeth extraction (13.58%), and root canal treatment (8.41%). Most participants in the severe dysfunction category had a history of dental fillings (1.42%) or teeth extraction (2.46%).

Participants' responses to Fonseca's 10 questions are shown in Table 5. Chi-square analysis of the frequencies of responses to every question revealed a statistically significant difference ($p < 0.05$). Among the "yes" responses, the most frequently reported TMJ-related problem was poor articulation of the teeth (23.2%). Difficulty in opening the mouth (1.8%) was the least frequently reported problem.

Among the "sometimes" responses, nervousness (26.1%) was the most frequently reported problem. Earaches or pain in the cranio mandibular joints (5.7%) was the least frequently reported problem.

4. Discussion

The present study provides information about the prevalence and severity of TMDs, based on the FAI, in male university students of Riyadh, Saudi Arabia. The response rate of the questionnaire (∼ 67%) compared to other studies (de Oliveira et al., 2006; Modi et al., 2012; Nomura et al., 2007) was regarded as satisfactory. The prevalence of TMDs based on the FAI varies among published studies. In our study 46.8% of participants were classified by the FAI as having light, moderate, or severe TMD. This prevalence is within the range of FAI-based TMD prevalence rates (42–68%) reported by other investigators (Modi et al., 2012; Conti et al., 1996; Nomura et al., 2007; Shiau and Chang, 1992; de Oliveira et al., 2006). In addition to factors such as ethnic background and sample size, the variation in TMD prevalence among these studies may be attributed to gender distribution. According to some studies (de Oliveira et al., 2006; Nomura et al., 2007), females have a greater risk of TMD than males. In our study, only male students were included; therefore, our TMD prevalence estimate might be underestimated.

Our study also examined the impact of relevant medical and dental histories on the prevalence of TMDs in Arabic university students. Nearly one-third of participants had a history of psychological stress, and out of these 57.8% was classified as having some degree of TMD dysfunction ranging from light to severe. These outcomes are in agreement with those of Pesqueira and colleagues (2010) and Bonjardim and colleagues (2009), who asserted that stress and anxiety play

Table 4 Level of TMJ dysfunction with medical and dental history of concern of the participants included in the analysis ($N = 280$).

Medical or dental complaint	Fonseca's classification				Chi square p value
	Without dysfunction N (%)	Light dysfunction N (%)	Moderate dysfunction N (%)	Severe dysfunction N (%)	
Psychological stress $N = 83$ (29.64%)	35 (42.2)	35 (42.2)	12 (14.4)	1 (1.2)	.079
Root canal treatment $N = 202$ (72.14%)	29 (14.35)	31 (15.34)	17 (8.41)	1 (0.49)	.000
Fillings $N = 211$ (75.35%)	103 (48.81)	82 (38.86)	23 (10.90)	3 (1.42)	.062
Teeth extraction $N = 81$ (28.92%)	31 (38.27)	37 (45.67)	11 (13.58)	2 (2.46)	.009
Dentures $N = 3$ (1.07%)	0 (0)	2 (66.66)	1 (33.33)	0 (0)	.241
Crowns and bridges $N = 37$ (13.21%)	11 (29.72)	16 (43.24)	10 (27.02)	0 (0)	.000

Table 5 Response of the participants to Fonseca's 10 questions ($N = 280$).

S. No.	Questions	Yes N (%)	Sometimes N (%)	No N (%)	Chi square p value
1.	Is it hard for you to open your mouth?	5 (1.8)	37 (13.2)	238 (85)	.000
2.	Is it hard for you to move your mandible from side to side?	8 (2.9)	25 (8.9)	244 (87.1)	.000
3.	Do you get tired/muscular pain while chewing?	35 (12.5)	62 (22.1)	180 (64.3)	.000
4.	Do you have frequent headaches?	42 (15)	52 (18.6)	186 (66.4)	.000
5.	Do you have pain on the nape or stiff neck?	22 (7.9)	58 (20.7)	199 (71.1)	.000
6.	Do you have earaches or pain in cranio mandibular joints?	8 (2.9)	16 (5.7)	255 (91.1)	.000
7.	Have you noticed any TMJ clicking while chewing or when you open your mouth?	34 (12.1)	62 (22.1)	182 (65)	.000
8.	Do you clench or grind your teeth?	48 (17.1)	31 (11.1)	199 (71.1)	.000
9.	Do you feel your teeth do not articulate well?	65 (23.2)	30 (10.7)	184 (65.7)	.000
10.	Do you consider yourself a tense (nervous) person?	54 (19.3)	73 (26.1)	152 (54.3)	.000

important roles in TMDs by acting as predisposing or aggravating factors. However, it is difficult to measure a variable such as stress or anxiety. Moreover, although efforts have been made to find the prevalence of stress among TMD patients, there is a need for long-term studies of this issue in the local population.

Historically, dental professionals have thought that occlusion is strongly linked to the occurrence of TMDs. This notion is supported by little scientific data, and literature reviews by Higdon (2009) and Badel et al. (2012), suggest that occlusion is not the dominant cause of TMDs. Nevertheless, occlusion is a basic issue associated with dental restorative procedures that change or supplement the compromised or lost occlusal relations. Any error in occlusion caused by dental treatment results in increased muscle tension and pain, which cause a mild unloading of the TMJ. This malocclusion sometimes leads to a TMD, depending on the degree of occlusal error.

Interestingly, a history of dental treatment was a very common finding among the participants in our study. Almost one-fourth of participants who were classified as having moderate to severe dysfunction had a history of past dental treatment. However, such an association should be interpreted carefully in light of the limitations of this study, such as the use of a brief questionnaire, a conveniently selected sample, a sample population comprised of only male students, and distribution of the questionnaire among all levels of undergraduate and graduate students. Although our study provided some information regarding the prevalence and severity of TMDs in young male Saudis, long-term clinical studies should be conducted in this region. Early diagnosis and prevention of future complications associated with TMDs are key for successful TMD treatment.

5. Conclusions

Based on the FAI, mild to moderate prevalence of TMD appears to be evident among male Saudi university students. The FAI is a useful TMD screening tool that has important implications for the early diagnosis of TMD and the prevention of future complications from it. Histories of psychological stress and dental treatment were found in students with mild to severe TMJ dysfunction. Therefore, the collection of relevant medical and dental histories might be useful in the TMD screening process. Longitudinal studies in this population are warranted to follow the prevalence of TMD and the healthcare needs of TMD patients.

Conflict of interest

Authors declare no conflict of interest associated with this publication.

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