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Original Article

The Relationship Between Temporomandibular Joint Disorders and Headaches Among Students of the Faculty of Dentistry, Islamic Azad University of Tabriz, Iran

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Abstract

Introduction: Temporomandibular disorders (TMDs) are dysfunctions of the temporomandibular joints and masticatory muscles accompanied by facial discomfort and pain. This study aimed to clarify the association between TMD and headache among the dental students of the Faculty of Dentistry, Islamic Azad University of Tabriz.

Methods: This cross-sectional study was conducted among dental students at different levels of education at Islamic Azad University of Tabriz in 2024. The main measurement of the study was to determine the frequency of headache and TMD and the association between headache and TMD among the participants. Secondary measures were examining the association between demographic characteristics and personal habits with headache and TMD. The required information was collected using a self-designed questionnaire. The Fonseca's questionnaire was used for the evaluation of TMD. A P value of <0.05 was considered statistically significant.

Results: A total of 131 participants (69 females and 62 males) with a mean age of 23.15 ± 1.5 (range: 19.2–31.5) years, enrolled in the survey. Half of the students (51.14%) had a history of headache. Of these, 26 (19.85%) reported migraine headaches. Most participants (68%) had at least one of the symptoms of TMD. The most common symptoms associated with TMD were sleep bruxism (25.95%), neck pain (24.43%), clicking (22.14%), and migraine headache (19.85%), respectively. There was a significant relationship between migraine headaches and TMD ($P=0.05$). There was no statistically significant difference between the history of non-migraine headaches and TMD ($P=0.25$). The frequency of TMD was higher in girls ($P=0.035$). There was a significant relationship between anxious personality and TMD ($P=0.004$).

Conclusion: The prevalence of headache and TMD among dental students of Islamic Azad University of Tabriz was high. The most prevalent symptoms associated with TMD were sleep bruxism, neck pain, and clicking, respectively. In confirmation of previous findings, migraine headache was associated with TMD. There was no relationship between non-migraine headache and TMD. Girls and those with anxious personalities were more likely to have TMD.

Keywords: Temporomandibular disorders, Headache, Dental students, Migraine, Sleep bruxism

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Introduction

The temporomandibular disorder (TMD) is a term that is used to describe a group of conditions that result in pain and dysfunction of the temporomandibular joint, masticatory muscles, and surrounding structures (1,2). Clinically, TMD is characterized by pain in the facial and preauricular areas, headache, joint sounds, limited mouth opening, and limited movement of the lower jaw (2). It is a common public health problem, and its prevalence varies between 7% and 30% in different communities (3-5). The peak of symptoms in adults is between 20 years and 40 years (3).

TMD is likely a multifactorial disorder. Some causative factors are poor head and neck posture, chewing problems, parafunctional habits, some hereditary disorders, juvenile rheumatoid arthritis, malocclusion, stress, and

biopsychosocial disorders (3,6-8). However, the definitive cause of TMD has not been clearly established yet.

Primary headaches are the most common pain that adults experience during their lifetime. The estimated global prevalence of headache is 50% in the general population. Headaches can have a significant negative impact on cognitive, emotional, academic, and occupational activities, educational and social relationships, and well-being (9-12). Different types of headaches can appear concomitantly with TMD. TMD may also lead to headaches per se, worsen pre-existing headaches, and increase the negative impact of headaches (13). On the other hand, headaches are estimated to be 3–3.5 times more common in individuals with TMD than in those without TMD (2). Migraine headache is a prevalent disorder with a profound economic impact that remains largely undiagnosed (14). TMD may be considered a trigger or aggravating factor of migraine (15). The clinic-based studies established that TMD symptoms are more common in individuals with episodic and chronic migraine, episodic tension-type headaches, and chronic daily headaches relative to individuals without headaches (2,16-19).

Stress, anxiety, and other emotional disorders are likely associated with or exacerbate factors of TMD due to their destructive effects on chewing structures. However, the evidence in this regard is inconclusive (4,5,20,21).

Dental students are exposed to severe and prolonged stress during their training, mainly due to the length of the course and the nature of the curriculum. They must acquire high academic and practical clinical skills, and at the same time, they must have positive communication skills in dealing with patients (22). Identifying the relevant biological and psychosocial factors, as well as the signs and symptoms of TMD, helps in the early diagnosis of TMD, the promotion of effective interventions, and finally, the improvement of the general health of affected individuals.

The aims of the present study are to estimate the frequency of primary headache and TMD and the accompanying symptoms with TMD and to determine the association between primary headache and TMD in the dental students of the Islamic Azad University of Tabriz.

Materials and Methods

This cross-sectional study was conducted on the dental students of the Faculty of Dentistry, Islamic Azad University of Tabriz, in 2023-2024. The inclusion criteria encompassed all dental students who consented to participate in the study. However, individuals with systemic diseases (excluding migraine) associated with headaches, chronic medication users, those with psychiatric disorders treated with relevant medications, a history of head/neck surgery, and participants who failed to fully complete the questionnaire were excluded from the investigation. Informed written consent was obtained from all participants. Each participant was asked to fill out three questionnaires. The required data, including demographic characteristics, current level of education, marital status, native or non-native, personal habits (e.g., alcohol and tobacco consumption), general health, dental care, jaw dislocation, earache, headache, history of migraine, and teeth grinding, were obtained in the first self-designed questionnaire. The presence and severity of TMD symptoms were assessed using Fonseca's questionnaire (the second questionnaire). For this purpose, participants were asked to respond to each question as "yes", "no", or "sometimes". The Fonseca's questionnaire includes 10 items assessing TMD-related symptoms. Each item is answered as "yes" (10 points), "sometimes" (5 points), or "no" (0 points). The total score ranges from 0 to 100, and the severity of TMD is classified as 0–15 (no TMD), 20–40 (mild), 45–65 (moderate), and 70–100 (severe TMD) (23,24). The validity and reliability of Fonseca's questionnaire have been previously confirmed in studies performed in Iran, and it has been successfully applied in research settings (25). The third questionnaire (DASS-21), which was the standard questionnaire related to depression, anxiety, and stress (26), was used to measure the anxiety and stress levels of the participants. This scale consists of 21 items, with 7 items per subscale (depression, anxiety, and stress). Each item is scored on a 4-point Likert-type scale ranging from 0 ("Did not apply to me at all") to 3 ("Applied to me very much or most of the time"). The scores for each subscale are summed and then multiplied by two to yield the final score, consistent with the original 42-item version. The validity and reliability of Fonseca's questionnaire were confirmed in previous research performed in Iran (25). Finally, correlations between TMD and headache and individual characteristics were assessed and analyzed.

SPSS software (version 24.0) was utilized for statistical analysis. The data were analyzed by descriptive and inferential statistics. Percentages, frequencies, means, standard deviations (SD), and statistical charts were employed at the descriptive level. The chi-square tests and Fisher's exact test were performed to analyze qualitative variables and the association between variables with TMD and headache. A *P*-value of less than 0.05 was considered statistically significant.

Results

A total of 131 dental students (52.6% female) from all academic years were eligible for study. The mean ± SD age of the participants was 23.15 ± 1.5 (in the range of 19.2–31.5 years). The majority of the participants (52.67%) were at the internship level, and 35.11% were in the last year of dental education (intern). About 78.63% of the participants were single, and 56.49% were natives of Tabriz. Thirty-three participants (29.3%) had a history of smoking, and 10% of participants reported alcohol consumption. An anxious personality was identified in 54.96% of participants. The details of the characteristics of study participants are summarized in Table 1.

The findings revealed that the most frequently reported issues were anxious personality traits (54.96% answered "Yes"), sleep bruxism (25.95%), neck stiffness or pain (24.43%), and joint clicking (22.14%). Less commonly reported problems were jaw dislocation (2.56%), difficulty performing lateral jaw movements (0.76%), and jaw pain during chewing (2.29%), the details of which are provided in Table 2.

Table 3 analyzes the relationship between various demographic factors and the occurrence of headaches among dental students. Notably, there was a significant difference in headache occurrence between genders, with a higher prevalence among female students ($P=0.003$). No significant associations were found between headache occurrence and education level, marital status, alcohol consumption, or smoking status ($P>0.05$).

The results (Table 4) demonstrated a significant difference in TMD prevalence between genders, with a higher rate among female students ($P=0.035$). Other demographic variables, including education level, marital status, alcohol consumption, and smoking status, did not show statistically significant associations with TMD prevalence ($P>0.05$).

Table 1. Details of the Characteristics of the Study Participants

Variable	Count	Percent
Gender		
Male	62	47.33
Female	69	52.67
Educational level		
Basic sciences	16	12.21
Extern	69	52.67
Intern	46	35.11
Marital status		
Single	103	78.63
Married	28	21.37
Residential status		
Native	74	56.49
Non-native	57	43.51

Table 2. Status of Dental Students at Tabriz Islamic Azad University Based on Fonseca's Questionnaire Items

Indicator	Yes n (%)	No n (%)	Sometimes n (%)
History of migraine attacks	26 (19.85)	105 (80.15)	-
Difficulty opening mouth	4 (3.05)	115 (87.79)	12 (9.16)
Difficulty performing lateral jaw movements	1 (0.76)	119 (90.84)	11 (8.40)
Jaw pain during chewing	3 (2.29)	116 (88.55)	12 (9.16)
Frequent headaches	17 (12.98)	90 (68.70)	24 (18.32)
Stiffness/pain in the neck	32 (24.43)	72 (54.96)	27 (20.61)
History of ear pain unrelated to infection	20 (15.27)	111 (84.73)	-
Clicking sound when opening/closing jaw	29 (22.14)	77 (58.78)	25 (19.08)
Sleep bruxism	34 (25.95)	79 (60.31)	18 (13.74)
History of jaw dislocation	3 (2.56)	114 (97.44)	-
Daytime bruxism	16 (12.21)	91 (69.47)	24 (18.32)
Cheek/tongue biting during sleep	14 (10.69)	105 (80.15)	12 (9.16)
Anxious personality trait	72 (54.96)	59 (45.04)	-
Holding the phone between the head and shoulder	24 (18.32)	81 (61.83)	26 (19.85)
Limited jaw movements (opening/lateral/protrusion)	8 (6.11)	118 (90.08)	5 (3.82)

Discussion

Stress plays a major role in the development of TMD. Due to the academic conditions and performance pressure, dental students are particularly exposed to high levels of stress and TMD during their study course (27). This study investigated the frequency of headache and TMD and determined the correlation between TMD and headache in dental students.

The results indicated that a significant number (68%) of dental students experienced at least one of the symptoms of TMD. About half of dental students with TMD had headaches, and some of them (20%) had migraines. The most common symptoms associated with TMD were teeth grinding in sleep and back pain, respectively. Our findings about the prevalence of TMD in dental students are comparable with those of Mitro et al, reporting a high prevalence of TMD in dental students (28). They observed that 78% of undergraduate dental students had some degree of TMD. Likewise, Bonjardim et al found that 50% of 15–20-year-old students had TMD. Among the examined factors, stress and depression had a significant relationship with headache (29). In a study by Srivastava et al on 246 dental students in Saudi Arabia, 37% of subjects had TMD. The most common symptoms associated with TMD were pain in the jaw, temporal region, and peri-ear region (30). A similar prevalence of TMD was reported by Homeida et al (49.5%), Bal et al (46.4%), Alamri et al (53.5%), Medeiros et al (54.8%) (31-34). Different socioeconomic and educational conditions, as well as differences in TMD assessment methods, study design, and sample size, may be the reasons for the wide range of TMD prevalence in dental students in different studies.

The main finding of our study was the association between migraine headache and TMD, which conforms to the results of previous studies (16, 18, 35, 36, 37).

Franco et al, in a study on 300 participants, concluded that TMD subtypes and TMD severity were independently related to some types of headache and headache frequency (37). Gonçalves et al concluded that in women with TMD and migraine, migraine significantly improved only when TMD was treated (17). The results of our study on the association between migraine headache and TMD are also consistent with the data from the study by Franco et al, which was conducted on 158 individuals with TMD and 68 control cases in a specialized university clinic. They highlighted that in individuals with TMD, migraine

Table 3. Association Between Demographic Variables and Headache Occurrence Among Dental Students of Tabriz Islamic Azad University

Variable		Headache Status			*P*-value*
		Yes n (%)	No n (%)	Sometimes n (%)	
Gender	Male	2 (3.23)	50 (80.65)	10 (16.13)	0.003
	Female	15 (21.74)	40 (57.97)	14 (20.29)	
Education level	Basic sciences	1 (6.25)	12 (75.00)	3 (18.75)	0.82
	Intern	8 (11.59)	48 (69.57)	13 (18.84)	
	Extern	8 (17.39)	30 (65.22)	8 (17.39)	
Marital status	Single	12 (11.65)	71 (68.93)	20 (19.42)	0.62
	Married	5 (17.86)	19 (67.86)	4 (14.29)	
Alcohol consumption	Yes	1 (7.69)	9 (69.23)	3 (23.08)	0.80
	No	13 (15.66)	56 (67.47)	14 (16.87)	
Smoking	Sometimes	3 (8.57)	25 (71.43)	7 (20.00)	0.88
	Yes	3 (15.79)	13 (68.42)	3 (15.79)	
	No	11 (11.70)	66 (70.21)	17 (18.09)	
	Sometimes	3 (16.67)	11 (61.11)	4 (22.22)	

Note. *Chi-square test.

Table 4. Association Between Demographic Variables and TMD Among Dental Students of Tabriz Islamic Azad University

Variable		N (%)	*P* Value
Gender	Male	37 (59.68)	0.035
	Female	53 (76.81)	
Educational level	Basic sciences	13 (81.25)	0.07
	Intern	51 (73.91)	
	Extern	26 (56.52)	
Marital status	Single	72 (69.90)	0.57
	Married	18 (64.29)	
Alcohol consumption	Yes	9 (69.23)	0.91
	No	56 (67.47)	
	Sometimes	25 (71.43)	
Smoking	Yes	15 (78.95)	0.58
	No	63 (67.02)	
	Sometimes	12 (66.67)	

Note. *Chi-square test. TMD: Temporomandibular disorder.

was the most common primary headache. TMD was also associated with an increased frequency of primary headache (37). It can be concluded that TMD and migraine headaches are comorbid.

Our results also revealed that the frequency of TMD in females is more common than in males, which is in line with the findings of many previous studies, stating that TMD is more common in women (7,32,36,39-40). For instance, Velly et al, in a survey on 83 subjects attending dental clinics, found that females were almost three times more likely to develop myofascial pain than males (40), which contradicts the results of some previous researchers, indicating that there was no association between gender and TMD (23,34). The higher prevalence of TMD in women may be related to hormonal and physical differences, such as muscle structure or different pain thresholds in response to painful stimuli. It also appears that women are more likely than men to seek treatment and pain relief because women are more sensitive to possible social rejection.

The relationship between TMD and stress and anxiety has been widely explored in the literature. Confirming the statements of previous researchers (42-46), our findings demonstrated a significant relationship between anxious personality and TMD. Similarly, List and Jensen reported a relationship between TMD and anxiety in 754 medical students (3).

Contrary to our finding, Lövgren et al observed that psychosocial factors did not differ between those with or without a TMD diagnosis (26). One possible reason for these contradictory results could be the difference in study designs, sample size, sampling methods, and geographic location.

In this study, there was no statistical correlation between marital status and TMD. Likewise, Warzocha et al (46) did not find an association between marital status and TMD. However, Srivastava et al (30) and Maracci et al (47) confirmed a strong correlation between TMD and being married. This discrepancy may be explained by differences in living standards, levels of awareness, cultural differences, or differences in sample size.

Limitations of the Study

This study had some limitations. First, this study is subject to potential recall bias due to the use of self-reported questionnaires, which may affect the accuracy of headache and TMD reporting. The cross-sectional design prevents any causal inferences regarding the association between TMD and migraine. Moreover, since the study population was limited to dental students at a single institution, the findings may not be generalizable to other student populations or the general public. Overall,

the results of this study increase our knowledge about TMD and related factors in a specific population group. Undoubtedly, future research related to the causes of the high prevalence of this disorder and preventive measures will be valuable.

Given the limitations of this cross-sectional and single-institution study, future research should focus on longitudinal and multicenter investigations to evaluate temporal relationships and potential causal links between TMD and migraine. Including a matched control group of non-dental students could improve the generalizability and interpretability of the findings. Moreover, studies exploring the neurobiological mechanisms underlying the comorbidity between TMD and anxiety/migraine are warranted. It is also recommended that future studies investigate the effectiveness of stress-reduction and mental health interventions on the incidence and severity of TMD among dental students.

Conclusion

The prevalence of headache and TMD was high among dental students of Tabriz Azad University. Migraine headache was related to TMD, but there was no association between non-migraine headache and TMD. Girls and anxious students were more likely to have TMD. There was no significant relationship between the educational level, marital status, and TMD.

The findings of this study can help identify the causes of TMD and headache and their exacerbation in dental students. Appropriate prevention, early interventions, and access to mental health services are essential to prevent further dysfunction in this high-risk group.

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Authors' Contribution

Conceptualization: Samin Salimi, Sanaz Helli
Data curation: Samin Salimi
Formal analysis: Sanaz Helli
Investigation: Samin Salimi
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Competing Interests

The authors declare that there are no competing interests.

Ethical Approval

The Research Ethics Committee of Tabriz Islamic Azad University of Medical Sciences approved the protocol of the study (No. IR.IAU.TABRIZ.REC.1403.067).

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