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ORIGINAL ARTICLE

ASSESSMENT OF TEMPOROMANDIBULAR DISORDER PREVALENCE AND SEVERITY IN RELATION TO OCCLUSAL CHARACTERISTICS AMONG DENTAL STUDENTS AT HAWLER MEDICAL UNIVERSITY

Maryam Fouad Bilal, Shaho Al-talabani, Shaheen Ali Ahmed

Department of Orthodontics, Hawler Medical University, Erbil, Iraq.

ABSTRACT

Background: Temporomandibular joint disorder (TMD) encompasses various clinical conditions affecting the temporomandibular joint (TMJ), masticatory muscles, and teeth. This study aimed to evaluate the prevalence and severity of TMD among dentistry students and to examine the relationship between TMD and occlusal classification.

Materials & Methods: A cross-sectional study was conducted at Hawler Medical University in 2024, (HMU) using Fonseca's questionnaire, involving 215 students aged 17–25 years. Data collection included three parts: demographic information, a 10-item Fonseca Anamnestic Index (FAI) assessing TMD severity (no dysfunction, mild, moderate, or severe dysfunction), and clinical examinations evaluating occlusal classifications, anterior/posterior crossbite, scissor bite, and measurements of overjet and overbite.

Results: Over half of the participants were affected by TMD, with 43.3% experiencing mild dysfunction. Students aged 23–25 years demonstrated significantly higher rates of moderate and severe TMD ($p < 0.032$), with only 26.1% exhibiting no dysfunction. No significant associations were found between TMD severity and variables such as deep bite, open bite, crossbite, posterior crossbite, or scissor bite, irrespective of orthodontic treatment history.

Conclusion: TMD is prevalent among HMU dentistry students. While malocclusion is not a definitive cause of TMD, its role in the etiology cannot be dismissed entirely.

KEY WORDS: Bite; Dentistry; Disorder; Dysfunction; Malocclusion; Occlusion; Pain; Teeth; Temporomandibular joint.

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INTRODUCTION

Temporomandibular joint disorder (TMD) is a prevalent health issue, encompassing a subset of painful orofacial conditions characterized by temporomandibular joint (TMJ) pain, masticatory muscle fatigue, limited mandibular movement, and articular clicking.[1] The multifactorial etiology of TMD is linked to emotional stress, occlusal interferences, tooth loss, postural deviations, masticatory muscle dysfunction, structural alterations in the TMJ, and interactions among these factors.[2] Additionally, prosthodontic rehabilitation, orthodontic treatments, orthognathic surgery, and mandibular fractures have been associated with TMJ changes, potentially exacerbating TMD.[3,4]

Malocclusion has been implicated in TMD development, as alterations in dental structure may influence the function of the stomatognathic system. Studies on Class I and II malocclusion, posterior crossbite, anterior open bite, horizontal overlap, and vertical overlap suggest that these factors contribute to TMD symptoms.[5] Orthodontic treatments, too, are debated as possible causes, remedies, or preventive measures for TMD due to their impact on occlusal patterns. Historically, dental occlusion was viewed as a principal factor in TMD onset.[6] The prevalence

Corresponding Author:

Dr. Maryam Fouad Bilal
Lecturer, Department of Orthodontics
Hawler Medical University
Erbil, Iraq
E-mail: maryam.bilal@hmu.edu.krd

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of TMD ranges from 30% to 50%, with variability influenced by population demographics, sampling designs, criteria, and data collection methods.[7]

Fonseca's questionnaire provides a multidimensional assessment of TMD. It comprises 10 questions evaluating TMJ pain, headaches, backaches, chewing pain, parafunctional habits, movement restrictions, joint sounds, perceived malocclusion, and emotional stress. Early diagnosis is critical, as delayed detection can lead to irreversible and destructive TMJ damage.[8] Moreover, the growing public demand for comprehensive oral health care, coupled with a higher incidence of TMD among dental students—particularly during exam periods—has underscored the importance of understanding its epidemiology. Data on TMD prevalence, distribution, and etiology is essential for developing effective prevention and treatment strategies.

This study aimed to assess the prevalence and severity of TMD among dental students at Hawler Medical University (HMU) using Fonseca's questionnaire and to explore its relationship with occlusal characteristics.

MATERIAL AND METHODS

This cross-sectional clinical study was carried out at the College of Dentistry, Hawler Medical University (HMU) in 2024, after obtaining ethical approval from the institutional review board. Two hundred and fifteen students between the ages of 17–25 years who volunteered to participate in the study were exploited with a written informed consented used for all subjects.

Data collection included three components: demographic data, the standardized questionnaire that provides the temporomandibular disorder (TMD) symptom assessment by Fonseca's Anamnestic Index (FAI), and clinical examination. The FAI is a 10-item measure for assessing TMD-related symptoms (ie, pain during movement of the jaws, joint sounds, headaches, parafunctional habits, emotional stress). Participants provided a "yes" (10 points), "sometimes" (5 points), or "no" (0 points) rating for each item. Total scores varied from 0 to 100, and the scores were classified based on severity levels into four categories, namely mild, moderate, severe, and very severe. None (0–15), mild (20–40), moderate (45–65), and severe (70–100) dysfunction.

Skilled examiners did clinical examinations through the use of disposable mirrors, zero-based rulers, and proper lighting. Regarding intraoral diagnoses, they consisted of Angle's classification of malocclusion, canine relation, overjet, overbite, open bite, deep bite, posterior and anterior cross bite, scissor bite, and mandibular displacement. SPSS version 26 was used to conduct statistical analysis. The Chi-square test and Fisher's exact test were used to evaluate associations between the severity of TMD and traits of occlusion, and for a statistical significance of $p \leq 0.05$.

RESULTS

Two hundred and fifteen dental students from Hawler Medical University College of Dentistry were enrolled in this cross-sectional study. The mean age of study participants was 20.6 (SD = 1.7) years. The majority of the participants were aged between 20 and 22 years (62.8%), and females constituted 58.1% of the sample (Table 1).

Table 1. Age and gender distribution.

		No.	(%)
Age (years)	17-19	57	(26.5)
	20-22	135	(62.8)
	23-25	23	(10.7)
Gender	Male	90	(41.9)
	Female	125	(58.1)
Total		215	(100.0)

More than half of the participants exhibited temporomandibular joint dysfunction (TMD), with the largest proportion (43.3%) classified as having mild dysfunction (Figure 1).

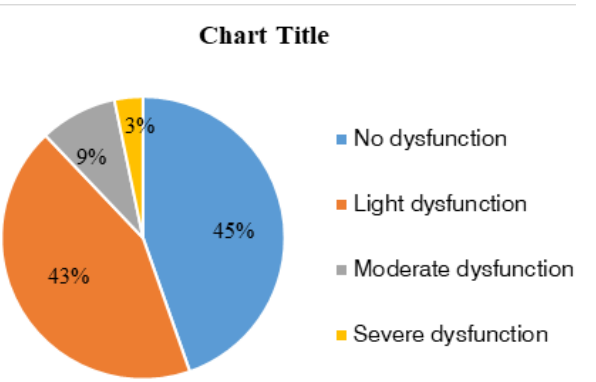

Figure 1. Prevalence of TMD and its severity.

More than half of the participants (55.3%) reported some degree of temporomandibular dysfunction; 43.3% had mild dysfunction, 8.8% moderate, and 3.3% severe dysfunction. A significantly higher prevalence of the moderate and severe form of TMD was observed for older students (23-25 years) as compared to the younger respondents ($p=0.032$); 26.1% reported no dysfunction. The t-test did not show any statistically significant gender differences when it comes to TMD severity ($p = 0.336$) (Table 2).

Table 2. TMD severity by age and gender.

	Categories of TMD severity				Total	P value*
	No Dysfunction	Light Dysfunction	Moderate Dysfunction	Severe Dysfunction		
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	
Age (years)						
17-19	28 (49.1)	27 (47.4)	2 (3.5)	0 (0.0)	57 (100.0)	
20-22	62 (45.9)	56 (41.5)	13 (9.6)	4 (3.0)	135 (100.0)	
23-25	6 (26.1)	10 (43.5)	4 (17.4)	3 (13.0)	23 (100.0)	0.032
Gender						
Male	45 (50.0)	38 (42.2)	5 (5.6)	2 (2.2)	90 (100.0)	
Female	51 (40.8)	55 (44.0)	14 (11.2)	5 (4.0)	125 (100.0)	0.336
Total	96 (44.7)	93 (43.3)	19 (8.8)	7 (3.3)	215 (100.0)	

*By Fisher's exact test.

Table 3. TMD severity by orthodontic treatment.

	Categories of TMD severity				Total	P value*
	No Dysfunction	Light Dysfunction	Moderate Dysfunction	Severe Dysfunction		
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	
Previous orthodontic treatment						
No	84 (46.2)	78 (42.9)	16 (8.8)	4 (2.2)	182 (100.0)	
Yes	11 (34.4)	15 (46.9)	3 (9.4)	3 (9.4)	32 (100.0)	0.165
Currently receiving orthodontic treatment						
No	88 (45.4)	83 (42.8)	18 (9.3)	5 (2.6)	194 (100.0)	
Yes	8 (38.1)	10 (47.6)	1 (4.8)	2 (9.5)	21 (100.0)	0.304
Total	96 (44.7)	93 (43.3)	19 (8.8)	7 (3.3)	215 (100.0)	

*By Fisher's exact test.

There was no substantial association of a history of orthodontic therapy (p = 0.165) or current therapy (p = 0.304), and TMD severity. The results of these findings seem to indicate that the use of orthodontic intervention does not seem to impact the prevalence or severity of TMD in this cohort (Table 3).

In participants without a history of orthodontic treatment, there was no significant relationship found between the severity of the TMD and the relationship of the right molar (p = 0.116). However, a statistically significantly positive correlation can be observed for the left molar relationship, in which approximately a half of the Class I patients had complaints of TMD compared to 80% of individuals from the Class III (p = 0.019).

A similar important relation was traced between TMD severity and right canine relationship. In this group, almost half of participants in Class I and II and all the participants in Class III experienced TMD symptoms (p = 0.023). The left canine relation also tended to the same direction with a significant relationship (p = 0.028).

There appears to be little or no correlation between TMD severity and class of incisors (p = 0.230); this seems to indicate that anterior occlusal characteristics may not have a significant contribution to the manifestation of TMD in this population.

On the opposite hand, among the participants that had a history of orthodontic treatment, there were no significant associations between TMD severity and any sagittal traits in occlusal relationship, including sagittal traits of right or left molar (p = 0.275, p = 0.316, respectively), sagittal traits of right or From these results, it can be presumed that orthodontic therapy will moderate or lessen the impact of malocclusion on the expression of TMD (Table 4).

Within subjects that have not received orthodontic treatment, no significant relationships were found between TMD severity and vertical or horizontal occlusion. Specifically, a significant correlation was not determined for the severity of TMD by: deep bite (p = 0.304), OBT (p = 1.000), ABT (p = 1.000), PBT (p = 1.000), and CBT (p = 1.000). crossbite posterior (p = 0.279) or scissor bite (p = 0.119). Although more

Table 4. Association between sagittal occlusal traits and TMD severity, stratified by orthodontic treatment history

Occlusal Trait & Side		Tmd Severity Category					
		No Dysfunction N (%)	Light Dysfunction N (%)	Moderate Dysfunction N (%)	Severe Dysfunction N (%)	Total N (%)	p -value
Right Molar Relation (No Ortho Tx)	Class I	65 (49.6%)	51 (38.9%)	14 (10.7%)	1 (0.8%)	131 (100%)	0.116
	Class II	9 (37.5%)	14 (58.3%)	0 (0.0%)	1 (4.2%)	24 (100%)	
	Class III	2 (33.3%)	3 (50.0%)	1 (16.7%)	0	6 (100%)	
Left Molar Relation (No Ortho Tx)	Class I	64 (50.8%)	48 (38.1%)	13 (10.3%)	1 (0.8%)	126 (100%)	0.019*
	Class II	11 (36.7%)	18 (60.0%)	0 (0.0%)	1 (3.3%)	30 (100%)	
	Class III	1 (20.0%)	2 (40.0%)	2 (40.0%)	0	5 (100%)	
Right Canine Relation (No Ortho Tx)	Class I	59 (48.4%)	45 (36.9%)	15 (12.3%)	3 (2.5%)	122 (100%)	0.023*
	Class II	19 (50.0%)	19 (100.0%)	0 (0.0%)	0	38 (100%)	
	Class III	0	5 (100%)	0	0	5 (100%)	
Left Canine Relation (No Ortho Tx)	Class I	61 (49.6%)	45 (36.6%)	15 (12.2%)	2 (1.6%)	123 (100%)	0.028*
	Class II	18 (45.0%)	21 (52.5%)	0 (0.0%)	1 (2.5%)	40 (100%)	
	Class III	0	4 (100%)	0	0	4 (100%)	
Incisor Relation (No Ortho Tx)	Class I	68 (49.6%)	53 (38.7%)	13 (9.5%)	3 (2.2%)	137 (100%)	0.230
	Class II	10 (45.5%)	12 (54.5%)	0 (0.0%)	0	22 (100%)	
	Class III	1 (14.3%)	5 (71.4%)	1 (14.3%)	0	7 (100%)	
Right Molar Relation (With Ortho Tx)	Class I	9 (31.0%)	15 (51.7%)	2 (6.9%)	3 (10.3%)	29 (100%)	0.275
	Class II	7 (43.8%)	7 (43.8%)	2 (12.5%)	0	16 (100%)	
	Class III	1 (50.0%)	0	0	1 (50.0%)	2 (100%)	
Left Molar Relation (With Ortho Tx)	Class I	9 (33.3%)	14 (51.9%)	1 (3.7%)	3 (11.1%)	27 (100%)	0.316
	Class II	6 (37.5%)	7 (43.8%)	3 (18.8%)	0	16 (100%)	
	Class III	1 (50.0%)	0	0	1 (50.0%)	2 (100%)	
Right Canine Relation (With Ortho Tx)	Class I	13 (40.6%)	14 (43.8%)	2 (6.3%)	3 (9.4%)	32 (100%)	0.206
	Class II	4 (36.4%)	6 (54.5%)	1 (9.1%)	0	11 (100%)	
	Class III	0	0	1 (50.0%)	1 (50.0%)	2 (100%)	
Left Canine Relation (With Ortho Tx)	Class I	12 (42.9%)	11 (39.3%)	2 (7.1%)	3 (10.7%)	28 (100%)	0.279
	Class II	4 (26.7%)	9 (60.0%)	2 (13.3%)	0	15 (100%)	
	Class III	1 (50.0%)	0	0	1 (50.0%)	2 (100%)	
Incisor Relation (With Ortho Tx)	Class I	14 (42.4%)	16 (48.5%)	1 (3.0%)	2 (6.1%)	33 (100%)	0.196
	Class II	2 (20.0%)	6 (60.0%)	1 (10.0%)	1 (10.0%)	10 (100%)	
	Class III	1 (50.0%)	0	0	1 (50.0%)	2 (100%)	

* Fisher's exact test used due to low expected cell counts.
Abbreviation: Ortho Tx = Orthodontic Treatment

people with a deep bite had a light dysfunction than those without, this difference was not significant.

In the same way, no significant relationships were found between TMD severity and deep bite ($p = 0.824$), open bite ($p = 1.000$), crossbite ($p = 0.270$), or posterior crossbite ($p = 0.601$) for participants having a history of orthodontic treatment. As a trend towards the rise in mild dysfunction was observed in this group of patients with deep bite or anterior crossbite, these associations were not statistically significant either (Table 5).

Table 5. Association Between Vertical and Horizontal Occlusal Traits and TMD Severity, Stratified by Orthodontic Treatment History

DISCUSSIONS

This study provides insights into the prevalence of temporomandibular disorders (TMD) among dental students using the Fonseca Anamnestic Index (FAI). Over half of the participants exhibited TMD symptoms, consistent with findings from studies conducted on university students in Turkey.[9] However, this prevalence contrasts with studies in Pakistan (41.6%),[10] and Turkey (47,53%).[11] These discrepancies may stem from differences in ethnicity, socio-demographic characteristics, or methodological approaches.

Age emerged as a significant factor, with older participants (23–25 years) exhibiting more severe symptoms. This aligns with the findings of Zieliński et al. in a study of 172,239 participants, which reported increased symptoms with age.[12] However, other studies have noted either no significant age-related differences or a decline in symptoms with age.[13] The heightened stress and anxiety among students nearing graduation may explain the higher TMD severity observed in this age group.

The current study found no significant gender differences in TMD prevalence, aligning with findings by Ashfaq et al. who concluded that gender does not significantly influence TMD outcomes.[14] However, other studies have reported contrasting results,[15] possibly due to differences in study populations or cultural norms regarding healthcare-seeking behaviors.

Orthodontic treatment was not significantly associated with TMD in this study, supporting findings from a Swedish study by Paço et al., which compared untreated Class II malocclusion, treated Class II malocclusion, and a control group. Their results indicated that orthodontic treatment with fixed appliances did not increase or exacerbate TMD symptoms.[16]

A significant association between TMD and Class III malocclusion was observed in participants without a history of orthodontic treatment. This supports findings that ortho-surgical management of Class III skeletal malocclusion can improve mandibular function and reduce TMD symptoms. Treatment of severe malocclusions has also been linked to better oral health-related quality of life.[17]

Crossbite, scissor bite, deep bite, and open bite malocclusions showed no significant associations with TMD in participants with or without orthodontic treatment history, consistent with findings by Khayat et al. However, deep bite malocclusion was more frequently associated with TMD, albeit without statistical significance, likely due to the severity of the malocclusion or age-related sample differences.[18]

Nguyen et al. concluded that occlusion alone is not a primary determinant of TMD.[19] Other studies have associated posterior crossbite, unilateral crossbite, and extreme maxillary overjet with severe TMD.[20] Angle Class I malocclusion, deep bite, and increased overjet were also linked to higher TMD prevalence.[21] However, certain occlusal traits, such as Class II malocclusion and lack of canine guidance, remain risk indicators for TMD.[22]

Given the small sample size for various malocclusion types in this study, further research with larger populations is warranted to better understand these associations in the local context.

CONCLUSION

This study highlights the high prevalence of temporomandibular disorders (TMD) among dentistry students at Hawler Medical University. While malocclusion is not a primary etiological factor, it may contribute to TMD development and should not be entirely excluded. Further research is necessary to identify risk factors, enabling effective prevention and treatment strategies.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	MFB, SA
Acquisition, Analysis or Interpretation of Data:	MFB, SA, SAA
Manuscript Writing & Approval:	MFB, SA, SAA

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.