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ORIGINAL ARTICLE

Prevalence and Clinical Characteristics of Temporomandibular Disorders in Adults: An Epidemiological Study in the Mediterranean Region of Türkiye

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ABSTRACT

The prevalence and clinical characteristics of temporomandibular disorders (TMD) in the Mediterranean region of Türkiye have not yet been thoroughly investigated**. Objective:** This study aimed to determine the prevalence and severity of TMD in a sample of the population in this region and to characterize the clinical findings related to TMD. **Methods:** Four hundred and one participants were included in this study. "Presence of TMD" in the participants was evaluated using the Fonseca Anamnestic Index. Through clinical examination, the findings in the participants were classified as limited mouth opening, deviation, temporomandibular joint (TMJ) sounds, TMJ pain, and muscle pain. **Results:** The prevalence of TMD was found to be 66.8%, with "Mild TMD" being the most frequent diagnosis among the participants. Clinical findings related to TMD were detected in 48.6% of the participants, and TMJ sounds were the most common clinical finding. TMD was most commonly found in participants over the age of 52, and clinical findings related to TMD were most common in participants between the ages of 25 and 38. In addition, a relationship was found between "Presence of clinical findings" and the gender and age of the participants ($p < 0.001$ for both comparisons). **Conclusion:** The results show that females may be more prone to TMD than males. During clinical examinations, it should be considered that "Presence of clinical findings" may be related to gender and age.

Key words: fonseca anamnestic index, temporomandibular joint, temporomandibular joint disease, temporomandibular joint disorder

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INTRODUCTION

The temporomandibular joint (TMJ) is a joint system consisting of an articular disk, fibrous capsule, synovial fluid, synovial membrane, muscles, and ligaments. Temporomandibular disorders (TMD) is a term that refers to problems associated with the masticatory muscles, the TMJ, and the structures surrounding them.[1] The risk factors for TMD, which have a complex and multifactorial etiology, include age, gender, psychosocial factors, and socioeconomic status.[2-4] TMD has more than one subgroup, and the diagnosis and treatment of TMD are quite challenging.[5] Clinically, various findings, such as joint pain, limitation of joint movement, sounds, asymmetric mandible movements, and restriction of jaw movements, are observed in TMD patients.[4]

In addition to clinical and radiographic examination, several diagnostic criteria are used for the diagnosis of TMD.[4,6] In the community, several questionnaires are used to evaluate TMD patients, which constitute important steps leading to correct diagnosis.[7-9] The Fonseca Anamnestic Index (FAI) is one of these questionnaires that determines the prevalence of TMD according to its severity.[10]

This study aimed to determine the prevalence and severity of TMD in a group of participants and to characterize its clinical findings.

METHODS

This study was approved by the Akdeniz University Faculty of Medicine Clinical Research Ethics Committee (Ethics approval number: KAEK-242), and it was performed in accordance with the ethical guidelines outlined in the Declaration of Helsinki. Volunteers were informed about the study, and written

informed consent was obtained from the patients prior to their participation.

The study involved 401 participants aged 18 and above who sought dental or maxillofacial radiology services at Akdeniz University, Faculty of Dentistry, Department of Oral and Maxillofacial Radiology, between June 2019 and September 2019. Participants were categorized into four age groups: age < 25, 25 ≤ age < 38, 38 ≤ age < 52, and 52 ≤ age. Patients were excluded from the study if they had systemic diseases affecting the TMJ, neuromuscular disorders, musculoskeletal disorders, cognitive disorders, a history of trauma to the head or face region, or a history of TMD or orthodontic treatment.

"Presence of TMD" among the participants was assessed using the FAI, which consisted of 10 questions (see Table 1). In this questionnaire, patients were required to respond with "Yes," "No," or "Sometimes," and these responses were scored as 10, 0, and 5, respectively. The presence and severity of TMD were determined based on the total score of the answers provided in this questionnaire.[11] TMD severity was categorized as follows: a score between 0 and 15 was classified as "Non-TMD," a score between 20 and 40 as "Mild TMD," a score between 45 and 65 as "Moderate TMD," and a score between 70 and 100 as "Severe TMD." In this study, participants who reported mild, moderate, or severe TMD were classified as having "Presence of TMD" according to the FAI.

The clinical examinations of the patients were conducted by a sole physician specializing in the field. The clinical findings were categorized as limited mouth opening (LMO), deviation, TMJ sounds, TMJ pain, and muscle pain. To gauge the maximum non-assisted mouth opening, the interincisal distance of the participants was measured using a caliper, and if it was 35 mm or less, it was deemed to be LMO.[12] In instances where one or more of these findings were observed, the clinical record was labeled as "Presence of clinical findings."

Table 1. Questions in the Fonseca Anamnestic Index.

1.	Do you have difficulty opening your mouth wide?
2.	Do you have difficulty moving your jaw from side to side?
3.	Do you feel fatigue or muscle pain when you chew?
4.	Do you have frequent headaches?
5.	Do you have neck pain or a stiff neck?
6.	Do you have earaches or pain in your temporomandibular joints?
7.	Have you ever noticed any noise in your temporomandibular joint while chewing or opening your mouth?
8.	Do you have any habits such as clenching or grinding your teeth?
9.	Do you feel your teeth do not articulate well?
10.	Do you consider yourself a tense (nervous) person?

Statistical analysis

The data obtained in our study were recorded as categorical variables based on their characteristics. We used Pearson's chi-square test to determine the relationships between these categorical variables. Data analysis was conducted using SPSS version 28 (SPSS Inc., Chicago, Illinois, USA), and statistical significance was considered at $p < 0.05$.

RESULTS

A total of 401 participants were included in the study, with 220 (54.86%) being female and 181 (45.14%) male. The mean age of the participants was 32.61 ± 11.77 years (min = 18, max = 71). In addition, the mean age of females was 34.21 ± 11.75 (min = 18, max = 70), whereas the mean age of males was 30.67 ± 11.52 (min = 18, max = 71).

According to the FAI, 36.7% (n = 147) of the participants had "Mild TMD," 15.2% (n = 61) had "Moderate TMD," and 15% (n = 60) had "Severe TMD." There was a statistically significant relationship between gender and TMD levels ($p < 0.001$) and between age and TMD levels ($p = 0.043$).

A significant relationship was also observed between gender and "Moderate TMD" ($p < 0.001$) and between gender and "Severe TMD" ($p < 0.001$), with "Moderate TMD" and "Severe TMD" being more common in females than in males. "Non-TMD" was found to be significantly more common in males than in females ($p < 0.001$). There was a significant relationship between age and "Severe TMD" ($p = 0.027$), with "Severe TMD" being most common in the 38–52 age group.

The presence of TMD at any level in the participants was classified as "Presence of TMD," and the rate of "Presence of TMD" was 66.8% (n = 268). The prevalence of TMD in female participants was 79.5% (n = 175), whereas it was 51.4% (n = 93) in males. Moreover, the prevalence of TMD in females was significantly more frequent than in males ($p < 0.001$).

"Presence of TMD" was 64% (n = 89) in the <25 age group, 68.1% (n = 96) in the 25–38 age group, 68.5% (n = 61) in the 38–52 age group, and 68.8% (n = 22) in the 52< age group. The relationship between age and "Presence of TMD" was not statistically significant ($p = 0.858$). The distribution of the participants according to TMD levels and the differences between the groups are detailed in Table 2.

The distribution of the clinical findings detected in the TMJ examinations of the participants was evaluated, and the relationships between the groups were tested. Accordingly, LMO was detected in 8% (n = 32) of participants, deviation in 28.9% (n = 116), TMJ sounds

Table 2. Distribution of the participants according to TMD levels and differences between the groups.

	Non-TMD		Mild TMD		Moderate TMD		Severe TMD		Sample	
	n	%	n	%	n	%	n	%	n	%
Sample	133	33.2	147	36.7	61	15.2	60	15.0	401	100
Gender										
Female	45	20.5	78	35.5	45	20.5	52	23.6	220	100
Male	88	48.6	69	38.1	16	8.8	8	4.4	181	100
p	<0.001*		0.581		<0.001*		<0.001*		<0.001*	
Age groups										
<25	50	36.0	62	44.6	16	11.5	11	7.9	139	100
25–38	45	31.9	51	36.2	20	14.2	25	17.7	141	100
38–52	28	31.5	25	28.1	17	19.1	19	21.3	89	100
52<	10	31.3	9	28.1	8	25.0	5	15.6	32	100
p	0.858		0.055		0.171		0.027*		0.043*	

*: p < 0.05; Chi-squared test; TMD: temporomandibular disorder.

Table 3. Distribution of the clinical findings detected in the TMJ.

	LMO		Deviation		TMJ sounds		TMJ pain		Muscle pain		Sample	
	n	%	n	%	n	%	n	%	n	%	n	%
Sample	32	8.0	116	28.9	134	33.4	63	15.7	51	12.7	401	100
Gender												
Female	25	11.4	83	37.7	96	43.6	55	25.0	42	19.1	220	100
Male	7	3.9	33	18.2	38	21.0	8	4.4	9	5.0	181	100
p	0.006*		<0.001*		<0.001*		<0.001*		<0.001*		<0.001*	
Age groups												
<25	7	5.0	25	18.0	34	24.5	14	10.1	13	9.4	139	100
25–38	16	11.3	57	40.4	55	39.0	28	19.9	22	15.6	141	100
38–52	6	6.7	27	30.3	33	37.1	14	15.7	11	12.4	89	100
52<	3	9.4	7	21.9	12	37.5	7	21.9	5	15.6	32	100
p	0.252		<0.001*		0.051		0.107		0.435		<0.001*	

*: p < 0.05; Chi-squared test; n: number; %: percentage
LMO: limited mouth opening; TMJ: temporomandibular joint

Table 4. Distribution of the clinical findings and TMD levels in the participants.

	Non-TMD		Mild TMD		Moderate TMD		Severe TMD		Sample		p
	n	%	n	%	n	%	n	%	n	%	
Sample	133	100	147	100	61	100	60	100	401	100	
Clinical findings											
LMO											
Presence	0	0	7	4.8	3	4.9	22	36.7	32	8.0	<0.001*
Absence	133	100	140	95.2	58	95.1	38	63.3	369	92.0	
Deviation											
Presence	18	13.5	35	23.8	26	42.6	37	61.7	116	28.9	<0.001*
Absence	115	86.5	112	76.2	35	57.4	23	38.3	285	71.1	
TMJ sound											
Presence	16	12.0	45	30.6	33	54.1	40	66.7	134	33.4	<0.001*
Absence	117	88.0	102	69.4	28	45.9	20	33.3	267	66.6	
TMJ pain											
Presence	0	0	10	6.8	11	18.0	42	70.0	63	15.7	<0.001*
Absence	133	100	137	93.2	50	82.0	18	30.0	338	84.3	
Muscle pain											
Presence	5	3.8	4	2.7	15	24.6	27	45.0	51	12.7	<0.001*
Absence	128	96.2	143	97.3	46	75.4	33	55.0	350	87.3	

*: p < 0.05; Chi-squared test; n: number; %: percentage; LMO: limited mouth opening
TMJ: temporomandibular joint; TMD: temporomandibular disorder.

Table 5. Relationship between "Presence of clinical findings" and "Presence of TMD".

	TMD			
	Presence	**Absence**	**Sample**	**p**
Clinical findings				
Presence				
n	167	28	195	
%	62.3	21.1	48.6	<0.001*
Absence				
n	101	105	206	
%	37.7	78.9	51.4	
Sample				
n	268	133	401	
%	100.0	100.0	100.0	

*: $p < 0.05$; Chi-squared test; n: number; %: percentage
TMD: temporomandibular disorder

Table 6. Relationships between the study variables and "Presence of TMD".

	Presence of TMD
Gender	<0.001*
Age	0.858
LMO	<0.001*
Deviation	<0.001*
TMJ sounds	<0.001*
TMJ pain	<0.001*
Muscle pain	<0.001*

*: $p < 0.05$; Chi-squared test
LMO: limited mouth opening; TMJ: temporomandibular joint; TMD: temporomandibular disorder.

in 33.4% (n = 134), TMJ pain in 15.7% (n = 63), and muscle pain in 12.7% (n = 51).

Furthermore, statistically significant differences were found between gender and LMO ($p = 0.006$), gender and deviation ($p < 0.001$), gender and TMJ sounds ($p < 0.001$), gender and TMJ pain ($p < 0.001$), and gender and muscle pain ($p < 0.001$). LMO, deviation, TMJ sounds, TMJ pain, and muscle pain were each more common in females.

In addition, age did not have a significant relationship with any clinical findings ($p > 0.05$), except deviation ($p < 0.001$). Deviation was more frequently observed in the 25–38 age group. These results are shown in Table 3.

The presence of at least one clinical finding in the participants was categorized as "Presence of clinical findings." According to this, "Presence of clinical findings" was identified in 195 (48.6%) participants. In female participants, the occurrence of "Presence of clinical findings" was 63.6% (n = 140), whereas in males, it was 30.4% (n = 55). The prevalence of "Presence of clinical findings" was significantly higher in females than in males ($p < 0.001$).

In the <25 age group, "Presence of clinical findings" was 34.5% (n = 48); in the 25–38 age group, it was 58.9% (n = 83); in the 38–52 age group, it was 55.1% (n = 49); and in the 52< age group, it was 46.9% (n = 15). A significant relationship was observed between age and "Presence of clinical findings" ($p < 0.001$).

The distribution of clinical findings and the levels of TMD in the participants were examined, and their relationships with each other were evaluated. LMO, deviation, TMJ pain, TMJ sounds, and muscle pain were most commonly found in participants with "Severe TMD." Additionally, a different clinical finding was most commonly observed in each level of the TMD group: deviation in "Non-TMD" participants, TMJ sounds in "Mild TMD" participants, TMJ sounds in the "Moderate TMD" participants, and TMJ pain in "Severe TMD" participants. A significant relationship was found between all clinical findings (LMO, deviation, TMJ sounds, TMJ pain, muscle pain) and TMD levels ($p < 0.001$). These results are presented in Table 4.

The relationship between "Presence of clinical findings" and "Presence of TMD" was tested and found to be significant ($p < 0.001$). It was determined that 62.3% of the participants with "Presence of TMD" exhibited clinical findings. TMD was detected in 85.6% of patients with "Presence of clinical findings." These results are presented in Table 5.

The relationship of each variable discussed above with "Presence of TMD" is summarized in Table 6. Every variable in the table, with the exception of age, was significantly associated with "Presence of TMD."

DISCUSSION

This study aimed to determine the prevalence and clinical characteristics of TMD in the Mediterranean region of Türkiye. According to our results, the prevalence of TMD was 66.8% in the participants, with "Mild TMD" being the most common. In addition, the most common clinical finding related to TMD was TMJ sounds.

The questionnaires used for diagnosing TMD are important tools for determining TMD prevalence. The FAI is one of these questionnaires. It is easy to perform, and low in cost.[13] In addition, it surpasses other questionnaires because it classifies TMD according to its severity, and it has been utilized in numerous studies to detect the prevalence of TMD.[8,10,14] Kaynak et al.[13] reported that the sensitivity (93.5%) and the specificity (83.07%) of FAI are adequate. They also found that the

FAI demonstrated excellent reliability and a high level of diagnostic accuracy.

Previous studies have shown that the prevalence of TMD varies between 53.3% and 71.9%.[4,8,10,14] Emel,[14] Augusto et al.,[10] and Karaman and Sapan[8] reported that "Mild TMD" was the most common level of TMD severity in participants, followed by "Moderate TMD" and "Severe TMD." In this study, consistent with the literature, "Mild TMD" was the most common level of TMD severity in the participants, followed by "Moderate TMD" and "Severe TMD." However, the prevalence of "Severe TMD" in our study (15%) was higher than that reported by Augusto et al.[10] (5.5%) and Emel[14] (2.05%). Different studies may find varying TMD prevalence and severity due to differences in their samples' physical and anatomical characteristics, changes in muscle and joint structure, lifestyle habits, socio-economic factors, anxiety, and depression.[15,16]

In our study, clinical findings related to TMD were observed in the TMJ examination of 48.6% of the participants. The most common clinical finding in the participants was TMJ sounds, followed by deviation, TMJ pain, muscle pain, and LMO. Most researchers agree that the most common clinical finding of TMD is TMJ sounds. However, different results have been reported regarding the prevalence of other clinical findings.[17-20] The differences in the prevalence of TMJ pain and muscle pain may occur because patients cannot clearly distinguish the difference between joint and muscle pain.[21] If a joint's function is not normal, pain in the muscles associated with the joint is an expected result. Additionally, bruxism patients may experience bruxism-induced muscle pain. When the relationship between TMD and bruxism is considered, the diagnosis of joint pain and muscle pain becomes more complicated.[22] Based on recent studies, an interincisal distance of 35 mm or less was accepted as LMO in our study.[23,24] However, some studies have defined different limits for LMO.[17,25] We believe that one reason for the variation in the LMO prevalence reported by previous studies may be the use of different measurement criteria. To achieve optimal results, it may be necessary to establish new approaches and specific numerical values for detecting LMO.

Previous studies concur that TMD[8,10,14] and clinical findings of TMD are more common in females than in males.[17,18] In our study, we also found that TMD and its clinical findings were more common in female participants. Furthermore, we found that advanced levels of TMD (moderate and severe TMD) were more common in females. These gender differences may be caused by structural disparities in the muscles and connective tissues of females, psychological and hormonal changes, and differences in brain functions and structure compared with males.[26]

The relationship between age and TMD is complex.[18] It is commonly believed that the age distribution of TMD patients follows a Gaussian curve, with a peak between the ages of 35 and 45 years and a lower prevalence in younger and older individuals.[27] However, AlZarea[28] reported that clinical symptoms increase with age and that clinical symptoms increase in edentulousness and with prosthesis usage in adults.

In most studies that used FAI, clinical signs and symptoms were evaluated based on patients' subjective responses to the questionnaire's questions. Discrepancies may exist between the TMJ symptoms reported by the same patient and the clinical findings determined by the clinician.[18] The objective evaluation of TMJ-related clinical findings conducted by the clinician in our study adds credibility to our research. However, our study has limitations in that it was single-centered and that the participants were not evaluated based on social status, edentulousness, prosthesis usage, bruxism, and race.

CONCLUSION

According to the results of our study, which was conducted in the Mediterranean region of Türkiye, TMD was detected in 66.8% of the participants. Most participants had "Mild TMD." TMD was most common in participants over the age of 52. TMD was found to be more common in females than in males, and "Severe TMD" was approximately six times more common in females than in males.

In our study, clinical findings related to TMD were detected in the TMJ of 48.6% of the participants. The most common clinical finding was TMJ sounds. "Presence of clinical findings" was most common between the ages of 25 and 38 and was more common in females than in males. In clinical examinations, it should be considered that "Presence of clinical findings" may be related to gender and age.

CONFLICT OF INTEREST

The authors report no conflicts of interest.

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