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Fonseca anamnestic index and temporomandibular disorder analysis in random patients

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Abstract

Aim: Temporomandibular disorders (TMDs) have frequently been encountered in the general population over past years. It is aimed to evaluate the presence of the TMD using the Fonseca Anamnestic Index (FAI).

Material and Methods: Individuals included in the study were aged 18 and over without known TMD, who applied to the prosthodontics clinic. The study included 120 volunteers, 61 male (50.98%) and 59 female (46.93%) participants. The mean age was 48.91±18.3 years. Intraoral findings and the presence/severity of TMDs of participants were evaluated with the FAI. The data from intraoral findings were collected and analyzed using descriptive statistical methods. The significance was evaluated at $p<0.05$ and $p<0.001$ levels.

Results: TMD was not observed in 43.33% (n=52) of the participants. Mild TMD was detected in 43.33% (n=52) of patients, moderate TMD in 8.33% (n=10), and severe TMD in 4.99% (n=6). While there was no significant difference between TMD severity levels and age (p=0.238), there was a significant relationship with gender (p=0.01). No correlation was found between FAI score and age (r=-0.078; p<0.40). While no pathological findings were present in 33.3% of patients, tooth wear was the most common intraoral finding (50.83%). A significant relationship was found between the presence of linea alba and TMD severity (p=0.001).

Discussion: FAI is a trustworthy diagnostic tool in clinical practice, which should be preferred to detect the severity of early stage TMD-related symptoms in individuals.

Keywords

Intraoral finding; Temporomandibular Joint, Temporomandibular Disorders, Fonseca Anamnestic Index

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Introduction

The temporomandibular joint (TMJ) is one of the most complex joints in the human body. It is responsible for the opening and closing of the jaw and controls the protrusion, retraction, and lateral movements of the mandible [1]. TMJ is also the kinematic bilateral connection of the skull between the mandible and temporal bones [2]. It is related to communication, emotional expression, and eating [1,2].

Temporomandibular disorders (TMDs) are clinical disorders recognized by symptoms such as pain in the TMJ or masticatory muscles, limitation of jaw movements, deviations/defects when opening the mouth, and clicking/popping or crepitation in the TMJ during function [3]. Even though TMD is not life-threatening, it typically impairs individuals' quality of life due to its chronic course. The severity of symptoms is related to the age and gender of the patients.

It is stated that women aged 20 to 40 presents more TMD symptoms at rates ranging from 2 to 6 times compared to men [4]. According to various sources, 8 out of 10 people treated by dentists have bruxism (clenching) or TMD [5]. In a study in Turkey, the incidence of TMD was reported as 31% [6]. TMD symptoms usually peak in middle age, as the need for prosthetic therapy and rehabilitation often increases.

Patients' awareness of TMD and their reasons for visiting the dentist may differ. Important factors that require patients to visit the dentist include sudden changes in occlusion due to the effects of the muscles controlling the jaw position and the presence of pain in the TMJ. In contrast, other studies have reported that TMD symptoms can be detected in healthy, asymptomatic individuals [7-9]. While Lövgren et al. reported that 30% of participants had TMD [9], Schiffman et al. reported that 69% of the participants presented TMD symptoms, with 34% of this group having severe TMD [7]. Solberg et al. reported that 65% of participants had TMD symptoms, but only 5% required treatment [8]. Thus, these studies collectively indicate that the assessment of the clinical severity of patients' complaints is more important than assessing the total symptoms alone [7-9].

The Fonseca Anamnestic Index (FAI) is a diagnostic tool that can be used to classify TMDs according to their severity [10,11]. This index can be used to determine TMJ pain, headache, bruxism, limitation of mandibular movement, presence of malocclusion, neck pain, and emotional stress [12]. Originally produced in Portuguese and English, FAI has been translated into many languages, including Arabic, Turkish, Spanish, and Chinese. FAI is used to identify pain-related and/or intra-articular TMDs [14], its Turkish version has been applied to investigate asymptomatic TMDs in clinical practice [15]. Topuz et al. preferred the FAI to evaluate the severity of TMDs in females [16], and Kaynak et al. examined its accuracy and reliability with TMDs [13].

The FAI is important for raising awareness to start treatments of TMD-related symptoms at an early stage.

The aim of this study is to determine the presence and severity of TMDs in individuals aged 18 and over without known TMD who applied to the prosthodontics clinic at the Pamukkale University (PAU) Faculty of Dentistry.

Material and Methods

Study design

The study was approved by the PAU Medical Ethics Committee (Approval no: E-60116787-020-113971). One hundred and thirty-five patients aged 18 and over had appointments at the Prosthodontics Clinic in October 2021. Three patients had mental disabilities, one chose not to participate in the study, and eleven were diagnosed with TMD before being excluded from the study. Finally, 120 volunteer patients without known TMD were included in the study.

Data collection

Intraoral findings (tooth wear, tooth and implant fracture, presence of linea alba) and the presence and severity of TMDs of the participants were evaluated.

Participants were provided with the Turkish version of the FAI in its validated form used by Kaynak et al. [13]. The FAI was utilized through an evaluation form consisting of 10 questions, each with three options (yes, sometimes, and no), and the answers to these questions were generated using the scoring guide reported with the original FAI report (yes=10, sometimes=5, and no=0). After scoring the responses, individuals were classified according to the severity of their current TMD from 0 to 15 points (no TMD), 20 to 40 points (mild TMD), 45 to 65 points (moderate TMD), and 70 to 100 points (severe TMD). The clinical data, including intraoral findings, collected for the study were evaluated by all investigators participating in the study.

Statistical analysis

The study data were analyzed using descriptive statistical methods. The Chi-square test was used to analyze qualitative variables. The Kruskal-Wallis test was used to compare quantitative data. Pearson's test was used for correlation evaluation. The significance was evaluated at $p<0.05$ and $p<0.001$ levels.

Results

A total of 120 volunteers, 61 male (50.98%) and 59 female (46.93%) participants were included in the study (Figure 1). The mean age of the participants was 48.91±18.3 years. The FAI results are shown in Table 1. While no TMD was found in 43.33% (n=52) of the study participants, 43.33% (n=52) of the participants reported mild TMD, 8.33% (n=10) reported moderate TMD, and 4.99% (n=6) reported severe TMD (Figure 2). In the mild TMD group, the most common complaint was stress (84.78%), followed by parafunctional habits (63.04%). In 56.25% of the participants with moderate TMD, pain in the masticatory muscles, parafunctional habits, and stress were reported. In the severe TMD group, pain in the masticatory muscles, neck pain, pain in the TMJ, sound in the TMJ, and malocclusion sensation (100%) were found at the same rate (Table 1).

There was no statistically significant difference in age between TMD-Fonseca severity levels ($p=0.238$, Table 2). When TMD-Fonseca severity levels were compared according to gender, a statistically significant relationship was found ($p=0.01$, Table 2). There was no correlation found between the total FAI score and age ($r=-0.078$; $p<0.40$). While no pathological findings were found in 33.3% of patients, tooth wear was the most common

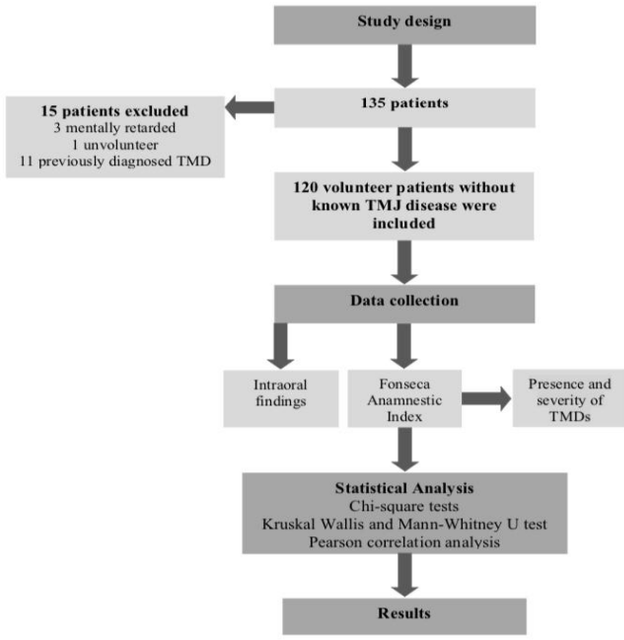

Figure 1. Study flowchart.

Table 1. FAI results and frequency of participants (number and percentage) who answered positively to the features in FAI.

Questions	No n (%)	Sometimes n (%)	Yes n (%)
Q1. Do you have difficulty opening your mouth wide?	105 (87.5)	9 (7.5)	6 (5)
Q2. Do you have difficulty moving your jaw to the sides?	106 (88.3)	10 (8.3)	4 (3.3)
Q3. Do you feel fatigue or muscle pain when you chew?	85 (70.8)	18(15)	17 (14.2)
Q4. Do you have frequent headaches?	78 (65)	27 (22.5)	15 (12.5)
Q5. Do you have neck pain or stiff neck?	69 (57.5)	22 (18.3)	29 (24.2)
Q6. Do you have earaches or pain in that area (temporomandibular joint)?	83 (69.2)	21 (17.5)	16 (13.3)
Q7. Have you ever noticed any noise in your temporomandibular joint while chewing or opening your mouth?	84 (70)	17 (14.2)	19 (15.8)
Q8. Do you have any habits such as clenching or grinding your teeth?	71 (59.2)	21 (17.5)	28 (23.3)
Q9. Do you feel that your teeth do not come together well?	72 (60)	10 (8.3)	38 (31.7)
Q10. Do you consider yourself a tense (nervous) person?	54 (45)	33 (27.5)	33 (27.5)

Answers to Questions	No TMD (0-15 point) (n=52)	Mild TMD (20-40 point) (n=46)	Moderate TMD (45-65 point) (n=16)	Severe TMD (70-100 point) (n=6)
A1. Difficulty opening mouth	0 (0)	4 (8.69)	6 (37.5)	5 (83.33)
A2. Difficulty in sideways movement	1 (1.92)	6 (13.04)	3 (18.75)	4 (66.66)
A3. Muscle pain when chewing	3 (5.76)	17 (36.95)	9 (56.25)	6 (100)
A4. Headache	10 (19.23)	21 (45.65)	6 (37.5)	5 (83.33)
A5. Neck pain	10 (19.23)	27 (58.69)	8 (50)	6 (100)
A6. Pain in TMJ	3 (5.76)	20 (43.47)	8 (50)	6 (100)
A7. Sound in TME	3 (5.76)	21 (45.65)	6 (37.5)	6 (100)
A8. Parafunctional habits	7 (13.46)	29 (63.04)	9 (56.25)	4 (66.66)
A9. Feeling of malocclusion	8 (15.38)	28 (60.86)	6 (37.5)	6 (100)
A10. State of stress	13 (24.9)	39 (84.78)	9 (56.25)	5 (83.33)

TMD: temporomandibular disorders

intraoral finding in 50.83% of the participants. In addition, a statistically significant relationship was found between the linea alba and TMD severity levels (p=0.001) (Table 2).

The relationships between gender and intraoral findings and answers to FAI questions were evaluated, as seen in Table 3. A statistically significant relationship was found between both genders and the absence of intraoral pathological findings (p=0.024). The incidence of pathology between the genders was found to be lower than its absence. A relationship was found between both genders and difficulty in mouth opening (p=0.008). In both genders, a significant difference was found between patients who did not have difficulty in mouth opening and those who sometimes had difficulty. Accordingly, the

Table 2. Comparison between temporomandibular disorder (TMD) severity levels and age, gender, and intraoral findings.

	TOTAL (N=120)	TMD SEVERITY LEVELS				p
		No TMD (n=52)	Mild TMD (n=52)	Moderate TMD (n=10)	Severe TMD (n=6)	
Age*	n Mean±SD Min-Max (Median)	n Mean±SD Min-Max (Median)	n Mean±SD Min-Max (Median)	n Mean±SD Min-Max (Median)	n Mean±SD Min-Max (Median)	
Female	n=59 46.93 ± 18.5 18-82 (51)	n=19 47.1 ± 18.3 21-81 (46)	n=27 47 ± 18.4 19-76 (53)	n=7 37.28 ± 19.1 18-65 (28)	n=6 57.28 ± 17.5 33-82 (52.5)	
Male	n=61 50.98 ± 18.1 18-85 (53)	n=33 53.48 ±17.4 18-85 (53)	n=25 49.24 ± 18.6 18-81 (54)	n=3 38 ± 19.9 25-61 (28)	n=0	0.238
Total	n=120 48.99 ± 18.3 18-85 (51)	n=52 51.15 ± 17.8 18-85 (51)	n=52 48.08 ± 18.39 18-81 (53.5)	n=10 37.5 ± 18.22 18-65 (28)	n=6 57.33 ± 17.53 33-82 (52.5)	
Gender**	n (%)	n (%)	n (%)	n (%)	n (%)	
Female	59	19[a] (32.2)	27[a,b] (45.8)	7[a,b] (11.9)	6[b] (10.2)	
Male	61	33[a] (54.1)	25[a,b] (41)	3[a,b] (4.9)	0[b]	0.01
Total (N=120)	120 (100)	52 (43.3)	52 (43.3)	10 (8.3)	6 (5)	
Intraoral Findings**	n (%)	n (%)	n (%)	n (%)	n (%)	
Tooth wear	61 (50.83)	32 (52.5)	24 (39.3)	4 (6.6)	1 (1.6)	0.106
Tooth or implant fracture	29 (24.16)	15 (51.7)	11 (37.9)	2 (6.9)	1 (3.4)	0.763
Linea alba	24 (19.99)	10[a] (41.7)	7[a] (29.2)	7[b] (29.2)	0[a] (0)	0.001
No pathological findings	40 (33.33)	17 (42.5)	17 (42.5)	2 (5)	4 (10)	0.282

*Kruskal-Wallis test (to determine the difference between the age data of the general population and the TMD severity levels) and **Pearson's chi-square test (for qualitative-qualitative parameter evaluations) were used for statistical analysis. The same superscript letter denotes a subset of TMD severity levels that are not significantly different from each other at the α=0.05 level, the different superscript letter denotes a subset of TMD severity levels that are significantly different from each other (p<0.05 and p<0.001). SD: standard deviation, Min: minimum, and Max: maximum.

number of patients with no restriction in opening was higher in both men and women. A significant relationship was found between both genders and muscle tiredness or pain during chewing (p=0.031). The rate of participants who did not have pain in chewing was found to be higher. A significant relationship was also found between the incidence of headache and gender (p=0.001). Accordingly, the number of patients without headache was found to be higher in both genders.

A statistically significant difference was found (p=0.002) regarding whether the FAI total score differed by gender. Accordingly, it has been determined that the total score of women is much higher than that of men.

Table 3. Relationship between gender, intraoral findings and answers to FAI questions

FINDING		GENDER		p
		Female n (%)	Male n (%)	
Intraoral Finding 1	Yes	25 (42.4)	36 (59)	0.068
	No	34 (57.6)	25 (41)	
Intraoral Finding 2	Yes	14 (23.7)	15 (24.6)	0.912
	No	45 (76.3)	46 (75.4)	
Intraoral Finding 3	Yes	12 (20.3)	12 (19.7)	0.927
	No	47 (79.7)	49 (80.3)	
Intraoral Finding 4	Yes	26 (44.1)[a]	14 (23)[a]	0.024*
	No	33 (55.9)[b]	47 (77)[b]	
Fonseca Question 1	No	46 (78)[a]	59 (96.7)[a]	0.008*
	Sometimes	8 (13.6)[b]	1 (1.6)[b]	
	Yes	5 (8.5)[a,b]	1 (1.6)[a,b]	
Fonseca Question 2	No	48 (81.4)[a]	58 (95.1)[a]	0.051
	Sometimes	7 (11.9)[a]	3 (4.9)[a]	
	Yes	4 (6.8)[a]	0[a]	
Fonseca Question 3	No	36 (61)[a]	49 (80.3)[a]	0.031*
	Sometimes	10 (16.9)[a,b]	8 (13.1)[a,b]	
	Yes	13 (22)[b]	4 (6.6)[b]	
Fonseca Question 4	No	29 (49.2)[a]	49 (80.3)[a]	0.001*
	Sometimes	17 (28.8)[a,b]	10 (16.4)[a,b]	
	Yes	13 (22)[b]	2 (3.3)[b]	
Fonseca Question 5	No	28 (47.5)	41 (67.2)	0.067
	Sometimes	12 (20.3)	10 (16.4)	
	Yes	19 (32.2)	10 (16.4)	
Fonseca Question 6	No	36 (61)	47 (77)	0.128
	Sometimes	12 (20.3)	9 (14.8)	
	Yes	11 (18.6)	5 (8.2)	
Fonseca Question 7	No	38 (64.4)	46 (75.4)	0.186
	Sometimes	8 (13.6)	9 (14.8)	
	Yes	13 (22)	6 (9.8)	
Fonseca Question 8	No	32 (54.2)	39 (63.9)	0.370
	Sometimes	10 (16.9)	11 (18)	
	Yes	17 (28.8)	11 (18)	
Fonseca Question 9	No	35 (59.3)	37 (60.7)	0.989
	Sometimes	5 (8.5)	5 (8.2)	
	Yes	19 (32.2)	19 (31.1)	
Fonseca Question 10	No	22 (37.3)	32 (52.5)	0.116
	Sometimes	16 (27.1)	17 (27.9)	
	Yes	21 (35.6)	12 (19.7)	
Fonseca Anamnestic Index Total Score	Mean ± SD	31.77 ± 24.77	18.27 ± 15.83	0.002**
	Min-Max (Median)	0-95 (30)	0-65 (15)	

*Pearson's Chi-Square test was applied. While there was no statistical difference between the data symbolized with the same lower case letters in terms of the answers given to the tested intraoral findings and Fonseca anamnestic index questions, a statistically significant difference was found between the data with different lettering. **Mann-Whitney U test was applied. Significance was evaluated at p<0.05 and p<0.001 levels. SD: standard deviation, Min: minimum, Max: maximum.

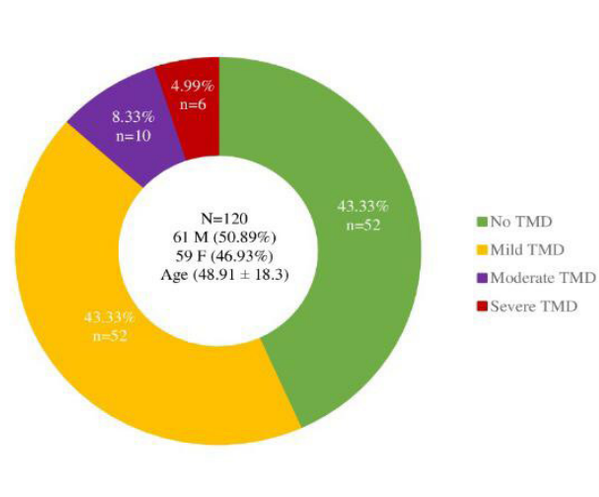

Figure 2. The number of participants by gender (n), age (mean ± SD), and TMD findings (%). Footnote: M= Male, F= Female, SD: Standard Deviation.

Discussion

In the present study, the presence and severity of TMD in asymptomatic and healthy individuals aged 18 years and over who attended appointments at a prosthodontics clinic were evaluated. Among the study participants, the largest group consisted of patients with mild TMD and without TMD at a rate of 40.33%. The second largest subgroup consisted of individuals with moderate TMD at a rate of 8.33%. For comparison with other studies, the rate of individuals with mild–moderate TMD was 62% in the study by Pedroni et al. [11], and the rate was 40% in the study by Conti et al. [3]. Nevertheless, in the study by Conti et al., most of the participants observed were in the non-TMD group 58.71% [3]. Like the findings in the present study, the participants with mild TMD in the study by Bevilaqua-Grossi et al. constituted the largest subgroup of the study population with a rate of 43.2% [10].

After the participants were grouped according to TMD-Fonseca severity, the present TMD findings in each group were determined as percentages. With this approach, we aimed to obtain detailed information about which factors drive patients to seek treatment and to raise awareness about their problems by analyzing the symptoms that are effective in the non-TMD group and in groups with different severities of TMD. As TMD severity increased, the percentage of all complaints mentioned in the FAI increased. In the severe TMD group, the symptoms were pain on chewing (item 3), neck pain (item 5), pain in TMJ (item 6), voice in TMJ (item 7) and malocclusion sensation (item 9). In the moderate TMD group, participants presented pain on chewing (56.25%) and parafunctional habits (item 8). In the mild TMD group and in the non-TMD group, 84.78% of participants reported stress (item 10). These were the most frequently reported responses with a rate of 100%. In addition, the presence of abrasion, which is the most important intraoral sign of bruxism, was the most common intraoral finding among

all patients with a rate of 50.83%.

TMD has a multifactorial etiology; closing disorder, trauma, stress, and parafunctional habits are the factors that enable the condition to progress [17]. As stated in neuromuscular theory, occlusal conflicts create an imbalance in the neuromuscular mechanism, triggering pain and spasms [18].

Malocclusion, defined as the deviation of the occlusion from the ideal level in terms of functionality and aesthetics, was an important complaint in all TMD and non-TMD groups in the present study. In addition, among 42 participants (30 females and 12 males) complaining of headache, a statistically significant difference was found (p=0.001). In addition, a positive correlation was found between the 4th answer of the index (headache) and the 6th answer of the index (pain in the TMJ; r=0.323; p<0.001), which are responsible for the sensory innervation of the head and face and share the same pain pathway [19].

In the present study, the prevalence of TMD was approximately one and a half times higher in females than males (n=40 (67.7%) and n=28 (47.9%), respectively). The results of the present study support the findings of Yaman et al., who found that TMD symptoms are more common in women [15]. When the total FAI scores were examined, it was found that female participants reported higher scores. Hormonal differences, variations in muscle structure, and connective tissue are likely to be the main reasons for this result.

Parafunctional habits, such as bruxism, cause biomechanical changes in articular surface structures due to overloading [20]. While this harmful habit was found at the lowest rate (13.46%) in the non-TMD group, the most severe level was found in the TMD group (66.6%). In 2018, bruxism, which was divided into two separate classes of sleeping and awake, can be evaluated as a movement disorder or sleep disorder and can also be observed in healthy individuals [21]. De Wijer et al. pointed out that parafunctional habits can be extremely destructive, although some individuals may not experience a significant impact on their mouth structures [22]. On the other hand, bruxism has been emphasized as an effective clinical risk factor in the development of TMD. Item 8 (bruxism) of the FAI demonstrated a correlation with item 6 (pain in TMJ) (r=0.230; p=0.012). As Soares et al. previously stated [23], we found in the present study that bruxism was associated with TMJ pain.

Postural changes play an important role in the etiology of TMD by causing changes in the position of the mandible. Neck pain complaints, reported by 100%, is one of the highest rates in the severe TMD group. The prevalence of neck pain due to postural changes influences the development of TMD [24].

Only 10% to 20% of the population with TMD symptoms seek treatment from a professional [25]. Our study revealed that 56.6% of individuals who had mild, moderate or severe TMJ disorders were unaware of the existence of TMD. For this reason, it is important to evaluate mouth opening and to diagnose limitations to mandibular movement early and prevent the onset of chronic TMDs.

Conclusion

The FAI is a useful diagnostic tool that saves time in clinical practice, and its use for detecting the severity of TMD-related symptoms at an early stage even in healthy individuals should be encouraged. The frequency of TMD is higher than expected in the population. Even if the patients attend appointments at the clinic without known or recognized complaints, the findings of the FAI study are important, both to encourage more efficient results in the following treatment protocols and for the purpose of treating TMD before it progresses. It will also help spread awareness about treating TMDs.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

Informed consent

This study was approved by the Pamukkale University Medical Ethics Committee (Approval no: E-60116787-020-113971).

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