

Original research article

Investigation of asymptomatic temporomandibular disorders with Fonseca anamnestic index in clinical practice

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ABSTRACT

OBJECTIVE: The study aims to evaluate the presence of temporomandibular disorders (TMD) and their severity in asymptomatic and healthy individuals using the Fonseca anamnestic index.

MATERIALS AND METHOD: A total of 135 individuals (80 females and 55 males, mean age 34.4±10.9) were involved in the study. The Fonseca anamnestic index was administered to the individuals. The data analysis was conducted by using Pearson's chi-squared test, Fisher's exact test, one-way ANOVA, and Spearman's correlation.

RESULTS: TMD was detected in 63% of the individuals. Most of them (40%) had mild TMD. The difference between gender and TMD severity was statistically significant ($p=0.001$). Temporomandibular joint (TMJ) pain showed a statistically significant positive correlation with headache and emotional stress ($r=0.312$, $p<0.001$; $r=0.299$, $p<0.001$, respectively). TMJ pain showed the strongest positive correlation with clicking ($r=0.443$, $p<0.001$). Bruxism showed positive correlations with the TMJ pain and clicking ($r=0.197$, $p=0.022$ and $r=0.221$, $p=0.010$, respectively).

CONCLUSION: The Fonseca anamnestic index is a reliable diagnostic tool that can be used to detect TMD-related symptoms and severity even in asymptomatic and healthy participants, providing rapid results in clinical practice.

KEYWORDS: Early diagnosis; temporomandibular joint; temporomandibular joint disorders

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INTRODUCTION

Temporomandibular disorders (TMD) are clinical problems with accompanying signs and symptoms, such as pain in the temporomandibular joint (TMJ) or chewing muscles, restrictions in jaw movements, deviation/deflection when opening the mouth, and the occurrence of clicking/popping or crepitation in the TMJ with function.^{1,2} Although TMD is not life-threatening, they typically harm individuals' quality of life due to their chronic course.³

The awareness of patients with TMD and their reasons for visiting an oral and maxillofacial surgeon may vary. A sudden difference in occlusion as a result of effects on the muscles controlling the chin position and the presence of pain in the TMJ is a key factor driving patients to visit the clinic.⁴ In contrast, other studies have reported that some TMD signs and symptoms are also detectable in healthy, asymptomatic individuals.⁵⁻⁷ Lövgren *et al.*⁷ reported that 30% of participants had TMD. Schiffman *et al.*⁵ reported that 69% of participants showed signs of TMD, and 34% of this group had severe TMD. Solberg *et al.*⁶ reported that 65% of the participants had TMD signs and symptoms, but only 5% required treatment. As such, these studies collectively seem to point out that it is more important to evaluate the clinical severity of patients' complaints rather than simply assessing the total signs and symptoms.⁵⁻⁷ The Fonseca anamnestic index is one diagnostic tool available for classifying TMD according to their severity.⁸⁻¹⁰ TMJ pain, headache, bruxism, limitation of mandibular movement, presence of malocclusion, neck and nape pain, and emotional stress can be determined with this index.¹¹

Table 1. Fonseca anamnestic index results; number (n) and percentage (%)

Questions	No n (%)	Sometimes n (%)	Yes n (%)
1. Is it hard for you to open your mouth?	105 (77.8)	20 (14.8)	10 (7.4)
2. Is it hard for you to move your mandible from side to side?	113 (83.7)	12 (8.9)	10 (7.4)
3. Do you get tired /muscular pain while chewing?	98 (72.6)	23 (17.0)	14 (10.4)
4. Do you have frequent headaches?	58 (43.0)	44 (32.6)	33 (24.4)
5. Do you have pain on the nape or stiff neck?	64 (47.8)	32 (23.9)	38 (28.4)
6. Do you have earaches or pain in craniomandibular joints?	90 (66.7)	24 (17.8)	21 (15.6)
7. Have you noticed any temporomandibular joint clicking while chewing or when you open your mouth?	87 (64.4)	23 (17.0)	25 (18.5)
8. Do you clench or grind your teeth?	84 (62.2)	16 (11.9)	35 (25.9)
9. Do you feel your teeth do not articulate well?	74 (54.8)	9 (6.7)	52 (38.5)
10. Do you consider yourself a tense (nervous) person?	62 (45.9)	35 (25.9)	38 (28.1)

Table 2. Frequency of participants (number and percentage) who answered positively to items on the Fonseca anamnestic index

Questions	No TMD (n=50)	Mild TMD (n=54)	Moderate TMD (n=17)	Severe TMD (n=14)
1. Is it hard for you to open your mouth?	0 (0.0%)	3 (5.6%)	1 (5.9%)	6 (42.9%)
2. Is it hard for you to move your mandible from side to side?	0 (0.0%)	1 (1.9%)	0 (0%)	9 (64.3%)
3. Do you get tired /muscular pain while chewing?	0 (0.0%)	4 (7.4%)	4 (23.5%)	6 (42.9%)
4. Do you have frequent headaches?	1 (2.0%)	16 (29.6%)	8 (47.1%)	8 (57.1%)
5. Do you have pain on the nape or stiff neck?	2 (4.0%)	18 (33.3%)	8 (47.1%)	10 (76.9%)
6. Do you have earaches or pain in craniomandibular joints?	0 (0.0%)	2 (3.7%)	7 (41.2%)	12 (85.7%)
7. Have you noticed any temporomandibular joint clicking while chewing or when you open your mouth?	0 (0.0%)	4 (7.4%)	8 (47.1%)	13 (92.9%)
8. Do you clench or grind your teeth?	2 (4.0%)	12 (22.2%)	9 (52.9%)	12 (85.7%)
9. Do you feel your teeth do not articulate well?	4 (8.0%)	24 (44.4%)	11 (64.7%)	13 (92.9%)
10. Do you consider yourself a tense (nervous) person?	3 (6.0%)	15 (27.8%)	11 (64.7%)	9 (64.3%)

TMD: temporomandibular disorders

The purpose of the present study was to investigate the presence of temporomandibular disorders using the Fonseca anamnestic index among asymptomatic and healthy participants and to determine the current severity of TMD in these individuals. In particular, we were interested in how the signs and symptoms associated with TMD show distribution among individuals with varying levels of severity and in ascertaining whether these factors further influence the severity and chronicity of TMD.

MATERIALS AND METHOD

The study was carried out compatible with the Declaration of Helsinki. Ethical approval was obtained from the Gazi University Faculty of Medicine Clinical Research Ethics Committee (No: 127). A total of 135 patients were included in this study. All participants signed a consent form before the start of the study. Participants who were 18 years of age or older, who did not have a systemic disease, who had come to the clinic due to a complaint other than TMJ disorders, who has not previously received orthodontic treatment, who had no history of TMJ trauma and treatment, and who agreed to answer the index questions were included.

The Fonseca anamnestic index used in this study was administered via an evaluation form consisting of 10 questions, where each question had three options (yes, no, and sometimes). The answers given to the questions were created by taking the scoring guide reported with the original Fonseca anamnestic index report.¹¹ After scoring responses, individuals were classified according to the severity of their current TMD. The scoring of this classification is as follows: zero to 15 points, no TMD; 20 to 40 points, mild TMD; 45 to 65 points, moderate TMD; and 70 to 100 points, severe TMD, respectively.

Statistical analysis

Cronbach's alpha coefficient was obtained by conducting an internal consistency analysis to measure the consistency of the responses to the Fonseca anamnestic index. The IBM SPSS Statistic version 21.0 software program (IBM Corporation, Armonk, NY, USA) was used for statistical analysis. The data of categorical variables were compared using Pearson's chi-squared test and Fisher's exact test, while continuous and normally distributed variables were compared with one-way ANOVA. Spearman's correlation test was used to evaluate correlations between items in the Fonseca anamnestic index. The results were interpreted at the level of $\alpha = 0.05$ statistical significance.

Table 3. Comparison of age, gender and intraoral findings among temporomandibular disorder (TMD) severity levels. Data are shown in mean \pm standard deviation or number (%).

	TMD severity levels					Test value	P
	Total (n=135)	No TMD (n=50)	Mild TMD (n=54)	Moderate TMD (n=17)	Severe TMD (n=14)		
Age	34.4 \pm 10.9	34.7 \pm 11.3	33.9 \pm 11.3	33.7 \pm 9.5	36.6 \pm 10.8	0.267 [†]	0.849
Gender							
Female	80 (59.3)	22 (44.0) ^a	30 (55.6) ^{a,b}	15 (88.2) ^b	13 (92.9) ^b	17.587[‡]	0.001
Male	55 (40.7)	28 (56.0) ^a	24 (44.4) ^{a,b}	2 (11.8) ^b	1 (7.1) ^b		
Intraoral findings							
Tooth wear	45 (33.3)	13 (26.0) ^a	13 (24.1) ^a	9 (52.9) ^{a,b}	10 (71.4) ^b	20.081[§]	0.006
Tooth & implant fracture	2 (1.5)	1 (2.0) ^a	0 (0.0) ^a	0 (0.0) ^a	1 (7.1) ^a		
Linea alba	13 (9.6)	5 (10.0) ^a	6 (11.1) ^a	1 (5.9) ^{a,b}	1 (7.1) ^b		
No pathological findings	75 (55.6)	31 (62.0) ^a	35 (64.8) ^a	7 (41.2) ^a	2 (14.3) ^a		

[†]One-Way ANOVA, [‡]Pearson's chi-square, and [§]Fisher's exact test. Same superscript letter denotes a subset of TMD severity levels whose column proportions do not differ significantly from each other at the $\alpha=0.05$ level based on the Bonferroni adjusted z-tests.

RESULTS

Of the 135 individuals included in this study, 80 were females and 55 were males, aged 18 to 50 years with an average age of 34.4 \pm 10.9 years. Data of the responses to the Fonseca anamnestic index were shown in Table 1.

TMD was not detected in 37% (n=50) of study participants, while 40% (n=54) reported mild TMD, 12.6% (n=17) reported moderate TMD, and 10.4% (n=14) reported severe TMD. Malocclusion (44.4%), which is the most common complaint in the mild TMD group, was followed by pain in the neck and nape (33.3%). Emotional stress and malocclusion were reported in 64.7% of the moderate TMD group. In the severe TMD group, clicking sounds in the TMJ (92.9%) were detected at the same rate as malocclusion (Table 2).

Of the 33 participants who complained of headaches, 26 were females and seven were males and a statistically significant difference was determined ($p=0.025$). Further, 19 of 21 people with complaints of pain in the ear and TMJ pain were females, 5 of 25 people who reported TMJ sounds while opening the mouth were males, and just eight of the 38 individuals who experienced emotional stress were males and, when these three factors were assessed according to gender, statistically significant differences were found ($p=0.004$, $p=0.050$, and $p=0.013$, respectively).

Descriptive data for the study participants are presented in Table 3. The mean age of the participants was 34.4 \pm 10.9 years, and there was no statistically significant difference between TMD Fonseca severity levels in terms of age ($p=0.849$, Table 3). When TMD Fonseca severity levels were compared according to gender, a statistically significant association was found ($p=0.001$, Table 3). In terms of gender distribution, post-hoc comparisons with Bonferroni adjusted z-tests revealed significant differences between the normal TMD group and patients with mild and moderate TMD. After clinical examination oral findings of all individuals

were recorded. In 55.6% of the patients, no pathological findings were observed, however, tooth wear was the most common intraoral finding as it was observed in 33.3% of the participants. Also, a statistically significant association was found between intraoral findings and TMD severity levels ($p=0.006$). Post-hoc comparisons showed that the prevalence of tooth wear was significantly higher in the severe TMD group, compared to normal and mild TMD groups.

In our study, 54.3% of participants answered 'yes' to the eighth item (bruxism) of the Fonseca anamnestic index. The relationship between this item in the index and the clinical observation of tooth wear was found to be statistically significant ($p=0.004$).

In our study, the Cronbach's alpha coefficient, which measures the internal consistency of the answers given by the individuals to the Fonseca anamnestic index, was 0.769. Also, the correlation between the 10 items of the Fonseca's anamnestic index was examined. In our study, a positive correlation of items 1, 2, 3, 6, 7, 8, and 9 of the index was determined (Table 4). The 4th item of the index (headache) had the strongest positive correlation with the 5th item of the index (stiffness, pain in the neck and nape) ($r=0.443$; $p<0.001$), while the 6th item of the index (pain in the ear and TMJ) showed the strongest positive correlation with the 7th item of the index (TMJ clicking) ($r=0.443$; $p<0.001$). The 10th item of the index (emotional stress) also showed a positive correlation with the 8th item (bruxism) ($r=0.263$; $p=0.002$) and the 5th item (stiffness and pain in the neck), ($r=0.191$; $p=0.027$). The 9th item (malocclusion) had positive correlations with the 6th item (pain in the ear and TMJ) and 7th item (TMJ clicking) ($r=0.210$; $p=0.014$ and $r=0.281$; $p=0.001$, respectively).

Table 4. Correlation between items in Fonseca anamnestic index

		I1	I2	I3	I4	I5	I6	I7	I8	I9
I2	r	0.325								
	p	(<0.001)								
I3	r	0.302	0.455							
	p	(<0.001)	(<0.001)							
I4	r	0.053	0.155	0.275						
	p	(0.539)	0.073	0.001						
I5	r	0.116	0.203	0.287	0.443					
	p	0.181	0.018	0.001	(<0.001)					
I6	r	0.313	0.419	0.313	0.312	0.294				
	p	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)				
I7	r	0.319	0.487	0.383	0.252	0.222	0.443			
	p	(<0.001)	(<0.001)	(<0.001)	0.003	0.010	<0.001			
I8	r	0.236	0.224	0.082	0.143	0.211	0.197	0.221		
	p	0.006	0.009	0.346	0.099	0.014	0.022	0.010		
I9	r	0.188	0.268	0.252	0.241	0.169	0.210	0.281	0.253	
	p	0.029	0.002	0.003	0.005	0.050	0.014	0.001	0.003	
I10	r	0.067	0.210	0.175	0.147	0.191	0.299	0.200	0.263	0.086
	p	0.439	0.015	0.043	0.088	0.027	<0.001	0.020	0.002	0.321

r: Spearman correlation coefficient, p: population correlation coefficient, p-values are calculated from Spearman's correlation analysis. I1 (Item 1): Is it hard for you to open your mouth?, I2 (Item 2): Is it hard for you to move your mandible from side to side?, I3 (Item 3): Do you get tired /muscular pain while chewing?, I4 (Item 4): Do you have frequent headaches?, I5 (Item 5): Do you have pain on the nape or stiff neck?, I6 (Item 6): Do you have earaches or pain in craniomandibular joints?, I7 (Item 7): Have you noticed any temporomandibular joint clicking while chewing or when you open your mouth?, I8 (Item 8): Do you clench or grind your teeth?, I9 (Item 9): Do you feel your teeth do not articulate well?, I10 (Item 10): Do you consider yourself a tense (nervous) person?

DISCUSSION

In this study, we assessed how the signs and symptoms associated with TMD appear in asymptomatic patients or in those with varying severities of TMD. Most study participants (40%) were individuals with mild TMD, whereas individuals without TMD composed the second largest subgroup (37%). In the study by Pedroni *et al.*,¹⁰ individuals with mild to moderate TMD were observed at a rate of 62%, while this rate was 40% in the study by Conti *et al.*²

Conti *et al.*² also observed that most participants were in the non-TMD group (58.71%). Similarly, participants with mild TMD (n=47) composed the largest subgroup of the study population of Bevilaqua-Grossi *et al.*'s study.⁹

After grouping participants according to TMD Fonseca severity, the current TMD findings in each group were determined with percentage rates. With this approach, we aimed to analyze the effective signs and symptoms in the non-TMD group and the groups with different severities of TMD and to obtain detailed information about which factors push patients to seek treatment and create awareness related to their problem. As TMD severity increased, the percentage of all complaints mentioned in Fonseca's anamnestic index increased. However, the most frequently mentioned complaint in all groups was the 9th item (malocclusion). In the severe TMD group, in addition to this, clicking sounds from the TMJ (item 7) were reported often.

TMD boasts a multifactorial etiology; occlusion, trauma, stress, and parafunctional activities are the factors driving the progression of the condition.^{12,13} As stated in the neuromuscular theory, occlusal conflicts trigger pain and spasms by creating an imbalance in the neuromuscular mechanism.¹⁴ Malocclusion, which is defined as the deviation of occlusion from the functional and aesthetically ideal level, was a major complaint in all TMD groups and in the non-TMD group in our study.¹⁵ In addition, 33 people reported headaches, and a statistically significant gender difference was found in terms of headache reports (p=0.025). Separately, a positive correlation was found between the 4th item of the index (headache) and the 6th item of the index (pain in the ear and TMJ) (r=0.312; p<0.001). Notably, TMD and headache disorders share the same pain pathway, which is responsible for the sensory innervation of the head and face.¹⁶ Both painful TMD and tension headache are highly exacerbated by stress and more frequently observed in females.¹⁷⁻¹⁹ A statistically significant positive correlation between the 6th item (pain in the ear and TMJ) and the 10th item (emotional stress) of the index supports this result. This finding supports the view that emotional stress may provoke further changes in muscle activity and occlusion.^{20,21}

In our study, the prevalence of TMD was approximately two times greater in females than in males (female (n): 58; male (n): 27). Our results support that TMD findings and symptoms are more prevalent in females.²² Hormonal differences and variations in muscle

structure and connective tissue are likely among the main causes of this result.²² Parafunctional habits, such as bruxism, cause biomechanical changes in structures at the joint surface due to overload.^{23, 24} This harmful habit was found at its lowest rate in the non-TMD group (4%), whereas this rate was at its highest in the severe TMD group (85.7%). Bruxism, which was divided into two separate classifications (sleep and awake) in 2018, can be considered a movement disorder or sleep disorder and is also observable in healthy individuals.²⁵ De Wijer *et al.*²⁶ pointed out that parafunctional habits can be extremely destructive, yet some individuals may not experience any significant impact on the oral structures. On the other hand, bruxism has been emphasized as an effective clinical risk factor in the development of TMD.²⁷ The 8th item of the Fonseca anamnestic index (bruxism) showed positive correlations with the 6th item (pain in the ear and TMJ) and the 7th item (clicking sounds in the TMJ) ($r=0.197$; $p=0.022$ and $r=0.221$; $p=0.010$, respectively). We found bruxism is associated with the development of TMJ pain and TMJ sound complaints, as Soares *et al.*²⁸ previously suggested. Postural changes play an important role in the etiology of TMD by causing changes in the mandible position.²⁹ The rate of neck stiffness and pain was the highest in the severe TMD group at 76.9%. Also, the 4th item (headache) of the index is highly associated with the 5th item (pain on the nape or stiff neck) ($r=0.443$; $p<0.001$). The prevalence of stiffness/pain in the neck and nape due to posture changes affect the development of TMD were consistent with previous study results.³⁰ Only 10% to 20% of the population with TMD symptoms are expected to consult a doctor concerning treatment.^{3,31} Our study revealed that 63% of individuals who are not aware of the presence of TMD have mild, moderate, or severe TMJ disorders. Therefore, the evaluation of mouth opening and the limitation in the mandibular movement are important to ensure early diagnosis and to prevent TMD from becoming chronic. A limitation of this study is the lack of a larger population. Hence, further studies with larger groups and longer follow-up are needed to confirm the results of this study.

CONCLUSION

The Fonseca anamnestic index is a reliable diagnostic tool that can be used to detect TMD-related symptoms and severity even in asymptomatic and healthy participants. This index is of great importance in raising awareness of individuals by starting the treatment of TMD-related symptoms at an early stage.

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Aseptomatik temporomandibular düzensizliklerin klinikte Fonseca anamnestic indeksi ile araştırılması

ÖZET

AMAÇ: Bu çalışmanın amacı, Fonseca anamnestic indeksi kullanılarak aseptomatik ve sağlıklı bireylerdeki temporomandibular düzensizliklerin saptanması (TMD) ve şiddetinin belirlenmesidir.

GEREÇ VE YÖNTEM: Çalışmaya 135 birey (80 kadın ve 55 erkek, ortalama yaş 34.4 ± 10.9) dahil edildi. Bu bireylere Fonseca anamnestic indeksi uygulandı. Verilerin analizi Pearson'un ki-kare testi, Fisher'in kesin testi, tek yönlü ANOVA ve Spearman korelasyonu kullanılarak yapıldı.

BULGULAR: Bireylerin %63'ünde TMD olduğu tespit edildi. Çoğunluğu (%40), hafif şiddetteki TMD'ye sahipti. Cinsiyet ve TMD'nin şiddeti arasında istatistiksel olarak anlamlı fark bulundu ($p=0.001$). Temporomandibular eklem (TME) ağrısı, baş ağrısı ve emosyonel stres ile istatistiksel olarak anlamlı pozitif bir ilişki gösterdi ($r=0.312$, $p<0.001$; $r=0.299$, $p<0.001$, sırasıyla). TME ağrısının en güçlü pozitif korelasyonunun klik sesi ile olduğu saptandı ($r=0.443$, $p<0.001$). Bruksizm, TME ağrısı ve klik sesi ile pozitif korelasyon gösterdi ($r=0.197$, $p=0.022$ and $r=0.221$, $p=0.010$, sırasıyla).

SONUÇ: Fonseca anamnestic indeksi, aseptomatik ve sağlıklı katılımcılarda bile TMD ile ilgili semptomları ve ciddiyeti tespit etmek için kullanılabilen ve klinik uygulamada hızlı sonuçlar sağlayan güvenilir bir tanı aracıdır.

ANAHTAR KELİMELER: Erken tanı; temporomandibular eklem; temporomandibular eklem bozuklukları