IVYSPRING INTERNATIONAL PUBLISHER

International Journal of Medical Sciences

2012; 9(7):539-544. doi: 10.7150/ijms.4474

Research Paper

Gender Difference in Prevalence of Signs and Symptoms of Temporomandibular Joint Disorders: A Retrospective Study on 243 Consecutive Patients

Bora Bagis[1]✉, Elif Aydogan Ayaz[2], Sedanur Turgut[2], Rukiye Durkan[3], Mutlu Özcan[4]

1. İzmir Katip Celebi University, Faculty of Dentistry, Department of Prosthodontics, İzmir, Turkey;
2. Karadeniz Technical University, Faculty of Dentistry, Department of Prosthodontics, Trabzon, Turkey;
3. Kocatepe University, Faculty of Dentistry, Department of Prosthodontics, Afyon, Turkey;
4. University of Zürich, Center for Dental and Oral Medicine, Clinic for Fixed and Removable Prosthodontics and Dental Materials Science, Zürich, Switzerland.

✉ Corresponding author: Assoc. Prof. Bora Bagis, Adress: İzmir Katip Celebi Universitesi Dis Hekimligi Fakultesi, Aydınlık Evler Mahallesi, Cemil Meriç Caddesi, 6780 Sokak. No:48, 35640-Çiğli/İzmir/Turkey. E-mail: bbagis@yahoo.com Tel: +90-532-6804656.

© Ivyspring International Publisher. This is an open-access article distributed under the terms of the Creative Commons License (http://creativecommons.org/licenses/by-nc-nd/3.0/). Reproduction is permitted for personal, noncommercial use, provided that the article is in whole, unmodified, and properly cited.

Received: 2012.04.16; Accepted: 2012.08.191; Published: 2012.08.30

Abstract

Background: This study evaluated the prevalence of the signs and symptoms of temporomandibular joint disorder (TMD) among patients with TMD symptoms. **Methods**: Between September 2011 and December 2011, 243 consecutive patients (171 females, 72 males, mean age 41 years) who were referred to the Department of Prosthodontics, Faculty of Dentistry, Karadeniz Technical University, Trabzon were examined physically and completed a questionnaire regarding age, gender, social status, general health, antidepressant drug usage, dental status, limited mouth opening, temporomandibular joint (TMJ) sounds, and parafunctions (bruxism, clenching). The data were analyzed using the chi-square test and binary logistic regression model (alpha = 0.05). **Results**: With a frequency of 92%, pain in the temporal muscle was the most common symptom, followed by pain during mouth opening (89%) in both genders. TMJ pain at rest, pain in the masseter muscle, clicking, grinding, and anti-depressant use were significantly more frequent in females than males. Age (p=0.006; odds ratio 0.954; 95% CI 0.922–0.987) and missing teeth (p=0.003; odds ratio 3.753; 95% CI 1.589–8.863) had significant effects on the prevalence of TMD. **Conclusion**: Females had TMD signs and symptoms more frequently than males in the study population. The most common problem in both genders was pain.

Key words: temporomandibular joint dysfunction, orofacial pain, epidemiology, oral parafunctions, dental health.

INTRODUCTION

It is generally accepted that the etiology of temporomandibular joint disorders (TMD) is multifactorial, and is related to a number of dental and medical conditions, such as occlusion, posture, parafunctional habits, restorative procedures, orthodontic treatment, emotional stress, trauma, anatomy of the disc, pathophysiology of the muscles, genetic and psychosocial factors, age, and gender [1,2]. Typical signs and symptoms of TMD are pain, limited mouth opening, joint sounds, mandibular deviation, and chewing disability. These symptoms may exist alone or in combination [2].

Pain is the most important symptom of TMD for both patients and clinicians, as it is often the main reason why patients seek for medical help [3]. Most patients suffer from pain during mandibular move-

ments, at rest, or on palpation of the muscles. Pain results from the changes in muscle activity that limit the movements of the mandible and protect it from further damage, while trying to promote healing [4]. TMD can also occur as a consequence of pain of non-dental origin in the orofacial region, including the head, face, and related structures [4]. TMD is a possible cause of headaches, as a positive correlation was found between TMD and the prevalence of headaches [4]. Fortunately, the treatment of symptomatic TMD significantly decreases headache complaints [5,6]. Although limited mouth opening is generally a result of painful mandibular movement, it may or may not be accompanied by pain. In general, mouth opening of less than 30 mm is considered limited [7].

Temporomandibular joint (TMJ) sounds, such as clicking or crepitation, are one of the most common symptoms, followed by headache [8]. Since sound is not always considered as a problem, but rather as a risk factor, TMJ clicking may be a normal variant rather than a disorder [9]. Changes in condyle morphology, disk displacement, and mechanical disk derangements may cause TMJ clicking without pain or significant dysfunction. Epidemiological studies have shown an increased prevalence of TMJ sounds among patients between 15 and 25 years old [10].

Studies have identified changes in occlusion, such as angle malocclusion, crossbite, open bite, occlusal interference, excessive overjet, and overbite, crowding, midline discrepancies, and missing teeth, as predisposing, triggering, or perpetuating factors for TMD [11]. The lateral bite forces between the retruded and intercuspal contact positions, as well as unilateral crossbite, are possible local risk factors for developing TMD [10]. Parafunctional habits such as bruxism, tooth clenching, gum chewing, biting foreign objects, and prolonged nail biting might increase the risk of developing TMD [10,11]. Parafunctional activities are usually harmless, until the forces exerted exceed the structural tolerance [7]. Bruxism and clenching reportedly lead to joint space reduction, followed by disc compression, and resulting pain in the masticatory muscles [9]. In addition, psychological factors have been closely linked to TMD and may be a component of the clinical presentation. Increased levels of somatization; *i.e.*, depression or anxiety, affect TMD sufferers negatively compared to people without TMD [12].

Epidemiology is a discipline that evaluates the frequency and distribution of conditions related to disease or health in a population. Epidemiological studies of TMD are important for amassing knowledge of symptomatic complexes and therapeutic approaches that might help to establish prevention and control programs [3]. Therefore, this study evaluated the prevalence of the signs and symptoms in TMD patients and investigated whether gender influences its prevalence.

METHODS

Subjects

Data were collected from 243 consecutive patients (171 females, 72 males; mean age 41 (range 14–59) years) seeking treatment for TMD at Karadeniz Technical University, Faculty of Dentistry, Department of Prosthodontics, Trabzon. Patients who joined the study gave informed consent. The Ethics Committee in Human Research of Karadeniz Technical University approved the research protocol (Number: 2011.91.21.2).

Patients with fibromyalgia, trigeminal neuralgia, burning mouth syndrome, atypical facial pain, migraine, atypical odontalgia, and cervical and neuropathic pain and those with a history of TMD treatment were excluded from the study.

Patients were initially questioned using a questionnaire based on the Research Diagnostic Criteria for TMD (RDC/TMD) [11] including the following items: age, gender, social status, general health (diabetes mellitus, osteoporosis, arthritis, etc.), antidepressant use, dental status (missing/filled teeth, fixed/removable prosthetic restorations), occlusion type, limited mouth opening, TMJ sounds, and parafunctions (bruxism, clenching).

Clinical examination

A history was taken and the patients were examined clinically, including the muscles and TMJ. The physical examination followed the order of the questionnaire items; *i.e.*, inspection, palpation, and an intraoral examination. The masticatory, subhyoid, suprahyoid, and head and neck muscle were examined. Tense areas and localized pain were identified. The masseter was palpated at its attachments to the zygomatic arch and angle of the mandible. The temporalis, in both the temporal fossa and intraorally along the ascending ramus of the mandible, and the medial pterygoid were examined bimanually, by placing one finger externally at the medial aspect of the angle of the mandible and the other intraorally in the lingual vestibule in the retromolar region. While the lateral pterygoid muscle was palpated behind the tuber maxilla in a medial direction, the digastric muscle was palpated at the mid-point between the angle of the mandible and the jaw. Mouth opening was measured between the central incisors using a

ruler. TMJ sounds were evaluated with a stereoscope and recorded as no sound, clicks, or crepitation.

One examiner examined all of the subjects and a second reviewer controlled whether all of the questions were understood and answered in full.

Statistical analysis

The data were analyzed using the statistical package SPSS for Windows, version 15.0 (SPSS, Chicago, IL). The chi-square test was used to compare the distribution of variables in TMD patients according to gender and binary logistic regression model tests were used to identify dominant factors. *P*-values less than 0.05 were considered statistically significant for all statistical tests. The confidence level was set at 95%.

RESULTS

The study population had more females (n=171, mean age 35 years) than males (n=72n 30%; mean age 41 years). Class I malocclusion (55% females, 20% males) was most common, followed by Classes II (11% females, 6% males) and III (4% females, 3% males).

In both genders, pain in the temporal muscle was the most common symptom, with a frequency of 92%, followed by pain during mouth opening (89%). TMJ pain at rest and pain in the masseter muscle were significantly more frequent in the females than males (Table 1). Among TMJ sounds and parafunctions, clicking (p=0.044) and grinding (p=0.013) were significantly more frequent in females than in males (Table 2).

Antidepressant use was reported by 16% of the patients and females reported significantly more use than males (p=0.021). Limited mouth opening was observed in 89% of the patients, but it was not significantly different between the genders (p=0.219). Hyperactivity in the temporal muscle was less frequent (8%; p>0.05; Table 3).

No significant difference was found between the dental status groups according to gender (p>0.05; Table 4).

Age (p=0.006; odds ratio 0.954; 95% CI 0.922–0.987) and missing teeth (p=0.003; odds ratio 3.753; 95% CI 1.589–8.863) had significant effects on the prevalence of TMD (Table 5).

Table 1. Incidence of TMD symptoms and differences between genders. *Significant at p<0.05.

Symptom	Female	Male	Significance	Incidence (%)
Pain during opening mouth	120	55	p=0.352	72
Pain during mastication	112	50	p=0.655	66
Headache	149	63	p=0.1	87
Earache	147	65	p=0.407	87
TMJ pain at rest	129	44	p=0.018*	71
Pain in masseter muscle	113	34	p=0.009*	39
Pain in temporal muscle	158	67	p=0.858	92

Table 2. Incidence of TMJ sounds, parafunctions, and differences between genders. *Significant at p<0.05.

Symptom	Female	Male	Significance	Incidence (%)
Clicking	74	21	p=0.044*	39
Crepitation	8	8	p=0.087	6
Clenching	96	37	p=0.573	54
Grinding	40	7	p=0.013*	19

Table 3. Incidence of other TMD symptoms, antidepressant use, and differences between genders. *Significant at p<0.05.

Symptom	Female	Male	Significance	Incidence (%)
Hyperactivity in temporal muscle	12	8	p=0.311	8
Limited mouth opening	150	67	p=0.219	89
Antidepressant drug use	21	18	p=0.021*	16

Table 4. Dental status and differences between genders. *Significant at $p<0.05$.

Dental status	Female	Male	Significance	Incidence (%)
Missing teeth	95	37	p=0.575	54
Unerupted teeth	37	14	p=0.863	20
Teeth with fillings	83	18	p=0.713	37
Fixed partial denture	34	17	p=0.605	20
Removable partial denture	13	5	p=0.858	7
Complete denture	5	5	p=0.150	4

Table 5. The effects of variables on TMD according to binary logistic regression model tests. *Significant at $p<0.05$.

Variables	B	S.E.	Wald	df	Significance	Exp (B)	95% CI.	
							Lower	Upper
Age	-,047	,017	7.554	1	,006*	,954	,922	,987
Wisdom tooth	-19.553	14373.941	,000	1	,999	,000	,000	.
Missing tooth	1.322	,438	9.096	1	,003*	3.753	1.589	8.863
Filling	-21.223	4814.836	,000	1	,996	,000	,000	.
Fixed partial denture	2.233	16747.565	,000	1	1.000	9.332	,000	.
Removable partial denture	-22.068	14094.323	,000	1	,999	,000	,000	.
Complete denture	20.982	14094.323	,000	1	,999	1295147073.969	,000	.
Drug use	38.155	9851.574	,000	1	,997	37206949702489390.000	,000	.
Constant	2.693	1.167	5.323	1	,021	14.776		

DISCUSSION

A number of factors have been studied in relation to TMD, such as dental status, number of teeth, parafunctions, clicking and locking of the jaws, and a history of trauma [2]. It has been difficult to characterize TMD owing to the large number of symptoms and signs, and the variation in the number and types manifested in any one patient. A systematic review of clinical studies reported that age, gender, and psychological factors were associated with TMD. Several retrospective clinical studies have investigated the relationship between the risk factors and TMD. Michelotti *et al*. examined the effect of oral parafunctions on TMD in 557 patients and concluded that diurnal parafunctional activities, especially daytime tooth clenching/grinding, were risk factors for subgroups of TMD and myofascial pain [13]. In a study of 87 patients with psychological distress, Lee *et al*. found jaw disability [14]. In another study, malocclusion and orthodontic treatment were not associated with TMD [15], while Hagag *et al*. found that occlusion and prosthodontic treatment influenced TMD [16].

This study studied the gender effect on the prevalence of signs and symptoms of TMD primarily. Generally, epidemiological studies have documented a greater frequency and severity of TMD in females than in males [11,17]. Although these differences have been explained by behavioral, psychosocial, hormonal, and constitutional factors, no conclusions have been drawn [11,15]. In our study, females were found to have a higher risk of TMD (2.3:1) than males, yet the results were not significant. Manfredini *et al*. made similar observations in a study of 433 patients in whom the risk ratio was 2.6:1 (276 females, 73.2%; 101 males, 26.8%) [17].

Patients with TMD generally suffer from different kinds of pain. Our study also demonstrated a strong relationship between TMD and orofacial pain. TMD-related orofacial pain is generally seen as a chronic, regional pain in the form of headaches or earaches. Our questionnaire indentified pain localized during opening mouth, mastication, or at rest, headache, and earache, and pain in temporal or masseter muscle. The patients mostly reported pain in the temporal region (92%), followed by headache (87%). Cooper *et al*. examined the presence of symptoms and signs of TMD in 4528 patients and reported that 96.1% of the patients complained of TMJ pain, followed by headache (79.3%) [2]. Although our study population was smaller than that of Cooper *et al*. [2], similar trends were observed.

The incidence of TMD pain in females has been studied widely [3]. While Velly *et al*. reported that females had approximately three times the risk of myofascial pain than males in a series 83 patients [18], Karibe *et al*. investigated 71 patients and found that

chewing significantly increased the pain in patients with a history of chronic masticator muscle pain, but also in females with no such history [19]. Moreover, the increased pain persisted significantly longer in females. According to our results, pain in the joint region in the resting position and in the masseter muscle was significantly greater in females than in males. This might be related to biological, anatomical, or hormonal factors acting alone or in combination in females.

Temporomandibular joint sounds, in the form of clicks and crepitus, are other signs and symptoms of TMD [8,20]. In our series, joint sounds were infrequent symptoms: 39% of the patients had clicking and 6% crepitus. In a similar study of 40 patients, clicking was observed in 40% and crepitus in 15% [21]. Although we found no significant difference between the genders regarding these signs, Troeltzsch *et al*. reported a significant difference in TMJ clicking in females compared to males in a series of 1031 patients [22]. In our study, a significant difference was found between genders in terms of clicking sounds, which were nearly four times more frequent in females than in males.

Painful jaw movements frequently lead to a reduction in mouth opening, which causes problems while chewing and social difficulty for the patients. Clinically, limited mouth opening poses problems for dental treatments. In general, the mouth opening is greater in males than in females [23,24]. This difference may be the result of the significant difference in mandibular length between males and females [21]. Our results also indicated that the patients with limited mouth opening were mostly females (61%) compared with males (28%), which might affect dental treatments.

Parafunctional habits such as bruxism, clenching, and grinding are considered among the important etiological causes of TMD [18,25]. In patients with bruxism, the habit of pressing or grinding the teeth changes the lubrication mechanism of the articular structures due to the overload on the articular surfaces, altering the TMJ biomechanics [26]. In this study, the most frequent parafunctional habit was clenching the teeth, with a frequency of 54%, followed by grinding in 19%. Psychological factors might be closely linked to these findings. Usually TMD patients show increased somatization, stress, depression, and anxiety [27,28]. In our series 16% of the patients reported using an antidepressant, and this rate was significantly higher in females. However, the main reason for the use of antidepressants could not be identified with our questionnaire. Further studies should also investigate whether drugs are used to avoid TMD symptoms. Nevertheless, the prevalence of TMD sounds and parafunctions tended to increase with the stress level, especially in females [28].

Studies have identified dental status, malocclusions, and missing teeth as factors predisposing to TMD [29,30], although the role of occlusion-related factors is controversial and they are weakly associated with TMD [10]. Regression analysis indicated a significant influence of missing teeth on the incidence of TMD. These results need to be verified in a larger population, while considering the number of missing teeth.

With its multi-factorial etiology, risk factors for TMD include age, gender, social status, and race. Although epidemiological studies generally concur, there are some contradictory results. One reason for this could be non-standardized examination procedures [10]. Despite numerous studies, the mechanism of TMD is not fully understood. Each clinician who is confronted with a patient complaining of symptoms TMD needs to address the entire problem to maximize the potential for a successful outcome. In our series, females were more likely to suffer from TMD. In addition, age-related factors and missing teeth should be considered when evaluating TMD patients. Healthcare systems might make use of this information when implementing policy.

CONCLUSIONS

Females had TMD signs and symptoms more frequently than males in our study population. The most common problem in both genders was pain. Headache, earache, pain in the temporal muscle, and limited mouth opening were the most frequent symptoms, being reported in more than 80% of the TMD patients. Age and missing teeth had a significant effect on the prevalence of TMD.

COMPETING INTERESTS

The authors have declared that no competing interest exists.

REFERENCES

1. Jensen R. Pathophysiological mechanisms of tension-type headache: a review of epidemiological and experimental studies. Cephalalgia. 1999;19:602-621.
2. Cooper BC, Kleinberg I. Examination of a large patient population for the presence of symptoms and signs of temporomandibular disorders. Cranio. 2007;25:114-126.
3. Dao TT, LeResche L. Gender differences in pain. J Orofac Pain. 2000;14:169-184.
4. Farsi NM. Symptoms and signs of temporomandibular disorders and oral parafunctions among Saudi children. J Oral Rehabil. 2003;30:1200-1208.
5. Goddard G, Karibe H. TMD prevalence in rural and urban Native American populations. Cranio. 2002;20:125-128.
6. Roda RP, Fernandez JMD, Bazan SH, Soriano YJ, Margaix M, Sarrion G. A review of temporomandibular joint disease (TMJD). Part II: Clinical

and radiological semiology. Morbidity processes. Med Oral Patol Oral Cir Bucal. 2008;13:102-109.
7. Cairns BE. Pathophysiology of TMD pain – basic mechanisms and their implications for pharmacotherapy. J Oral Rehabil. 2010;37:391-410.
8. Schmitter M, Rammelsberg P, Hassel A. The prevalence of signs and symptoms of temporomandibular disorders in very old subjects. J Oral Rehabil. 2005;32:467-473.
9. Tanaka E, Detamore MS, Mercuri LG. Degenerative disorders of the temporomandibular joint: etiology, diagnosis, and treatment. J Dent Res. 2008; 87:296-307.
10. Magnusson T, Egermarki I, Carlsson GE. A prospective investigation over two decades on signs and symptoms of temporomandibular disorders and associated variables. A final summary. Acta Odontol Scand. 2005;63:99-109.
11. Poveda Roda R, Bagan JV, Díaz Fernández JM, Hernández Bazán S, Jiménez Soriano Y. Review of temporomandibular joint pathology. Part I: classification, epidemiology and risk factors: review. Med Oral Patol Oral Cir Bucal. 2007;12:292-298.
12. Ferrando M, Andreu Y, Galdon MJ, Dura E, Poveda R, Bagan JV. Psychological variables and temporomandibular disorders: distress, coping, and personality. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2004;98:153-160.
13. Michelotti A, Cioffi I, Festa P, Scala G, Farella M. Oral parafunctions as risk factors for diagnostic TMD subgroups. J Oral Rehabil. 2010;37:157-162.
14. Lee LT, Yeung RW, Wong MC, Mc Millian AS. Diagnostic sub-types, psychological distress and psychosocial dysfunction in southern Chinese people with temporomandibular disorders. J Oral Rehabil. 2008;35:184-190.
15. Mohlin B, Axelsson S, Paulin G, Pietilä T, Bondemark L, Brattström V et al. TMD in relation to malocclusion and orthodontic treatment. Angle Orthod. 2007;77:542-548.
16. Hagag G, Yoshida K, Miura H. Occlusion, prosthodontic treatment, and temporomandibular disorders: a review. J Med Dent Sci. 2000;47:61-66.
17. Manfredini D, Chiappe G, Bosco M. Research diagnostic criteria for temporomandibular disorders (RDC/TMD) axis I diagnoses in an Italian patient population. J Oral Rehabil. 2006;33:551-558.
18. Velly AM, Gornitsky M, Phlippe P. Contributing factors to chronic myofascial pain: a case-control study. Pain. 2003;104:491-499.
19. Karibe H, Goddard G, Gear RW. Sex differences in masticatory muscle pain after chewing. J Dent Res. 2003;82:112-116.
20. Feteih RM. Signs and symptoms of temporomandibular disorders and oral parafunctions in urban Saudi arabian adolescents: a research report. Head Face Med. 2006;16:2.
21. Özkan N, Özkan F. The relationship of temporomandibular disorders with headaches: a retrospective analysis. Agri. 2011;23:13-17.
22. Troeltzsch M, Troeltzsch M, Cronin RJ, Brodine AH, Frankenberger R, Messlinger K. Prevalence and association of headaches, temporomandibular joint disorders, and occlusal interferences. J Prosthet Dent. 2011;105:410-417.
23. Mezitis M, Rallis G, Zachariades N. The normal range of mouth opening. J Oral Maxillofac Surg. 1989;47:1028-1029.
24. Gallagher C, Gallagher V, Whelton H, Cronin M. The normal range of mouth opening in an Irish population. J Oral Rehabil. 2004;31:110-116.
25. Austin DG. Special considerations in orofacial pain and headache. Dent Clin North Am. 1997;41:325-339.
26. Okeson JP. Long-term treatment of disk-interference disorders of the temporomandibular joint with anterior repositioning occlusal splints. J Prosthet Dent. 1988;60:611-616.
27. Pallegama RW, Ranasinghe AW, Weerasinghe VS, Sitheeque MA. Anxiety and personality traits in patients with muscle related temporomandibular disorders. J Oral Rehabil. 2005; 32:701-707.
28. Akhter R, Morita M, Esaki M, Nakamura K, Kanehira T. Development of temporomandibular disorder symptoms: a 3-year cohort study of university students. J Oral Rehabil. 2011;38:395-403.
29. Pullinger AG, Seligman DA. Quantification and validation of predictive values of occlusal variables in temporomandibular disorders using a multifactorial analysis. J Prosthet Dent. 2000;83:66-75.
30. Gesch D, Bernhardt O, Kirbschus A. Association of malocclusion and functional occlusion with temporomandibular disorders (TMD) in adults: a systematic review of population-based studies. Quintessence Int. 2004;35:211-221.