



The incidence of TMD in patients with earache

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ABSTRACT

Background and Objectives: Temporomandibular joint dysfunction (TMD) is known as a chronic pain in the ears manifested in the form of tinnitus, earache, hearing loss, vertigo, and other impairments. Although patients affected with this disorder undergo long-term treatments using various medicines without significant pain relief, medical care is still possible with a correct diagnosis. This study investigated the incidence rate of TMD in patients suffering from earache.

Materials and Methods: This cross-sectional study investigated the incidence rate of TMD in patients with earache referring to dental clinics affiliated to Tehran University of Medical Sciences (TUMS), Iran, including patients with over six months of earache or those having pain despite using medicines. The Diagnostic Criteria for TMD (DC/TMD) Axis I and II Protocol was used for examining TMD and stress, and also independent t-test and Chi-square test were employed to compare TMD patients in terms of age and gender.

Results: A total number of 100 individuals aged between 18 and 65 years, including 40 males and 60 females were examined in this study. The incidence rate of TMD in patients with earache was also reported by 76.5%.

Conclusion: The results indicated a high incidence rate of TMD in patients having earache. Accordingly, patients complaining about TMD required specialized earache evaluations by dentists and medics.

Keywords: Temporomandibular joint dysfunction; Earache; Tinnitus.

Introduction

Temporomandibular joint dysfunction (TMD) is an umbrella term covering multiple clinical problems affecting muscles in the masticatory system, temporomandibular joint (TMJ), as well as adjacent structures [1]. The given disorder is also considered as one of the

three frequent chronic pains after headache and backache [2]. It also influences 8 to 15% of adolescents, most often women [3]. Some common clinical pains caused by TMD can thus involve muscles in the masticatory system, TMJ, and adjacent tissues, and consequently appear as temporo-

mandibular pain, limitation in joint movements, or even clicking sounds or crepitus [4,5]. Some researchers have accordingly regarded the psychological state of patients as a predisposing factor of myofascial pain dysfunction syndrome (MPDS) and stress as a significant factor in teeth gnashing and grinding, which lead to spasms in masticatory muscles and TMJ pain. Therefore, physical and psychological treatments are necessary for reducing TMD symptoms, and the most common conservative treatments can be beneficial for relieving pain and moderating this dysfunction. Psychological dysfunctions include stress, increased muscle tone, pain, and MPDS [6,7]. Today, TMD is also classified as a psychological illness with chronic pain and multifactorial causes, as mentioned above [8,9]. The cause of these pains is often unknown, but neurological problems, genetic damages, and physiological factors have been widely reported [10-15]. Moreover, TMD-induced pains affect individuals' daily activities, psychological state, and quality of life. However, TMD treatment is very costly [16].

This disorder is accompanied by symptoms such as pains and dysfunctions in TMJ, masticatory muscles, as well as other areas of the face and the neck, including temporal, occipital, and frontal areas, and the head and the ears [17,18]. Other TMD symptoms are headache, tinnitus, earache, and bradyacusia [19-21]. The symptoms of first-onset TMD are earache, tinnitus, vertigo, and hearing loss. Tinnitus is also observed in most TMD patients [18,22,23], and 40-70% of these individuals are reported to suffer from vertigo [18]. Numerous studies in this field have suggested an anatomic and neuromuscular relationship between TMJ and tympanum [24,25]. Moreover, TMD has been considered as an etiology of earache [26].

The starting symptoms in TMD are earache, tinnitus, dizziness, and hearing loss. Tinnitus is also found in most people with TMD [18,22,23]. As well, vertigo has been reported in individuals with TMD by 40-70% [18]. Earache (that is, ear pain or otalgia) is a pain in one or both ears that may last for short or long time as a common health problem.

It is generally classified into two types: (1) primary earache resulting from ear pathology and (2) secondary earache that involves referred pain from other areas including dental abnormalities, chronic infection spreading to other tissues, pharyngeal, sinus or salivary gland infections, temporal arthritis, or TMD [27]. Dentists can thus use various treatments to eliminate these symptoms including pharmacotherapy, occlusal

splints, biofeedback, and physiotherapy. The main purpose of this study was to investigate the incidence rate of TMD in patients with earache referring to dental clinics affiliated to Tehran University of Medical Sciences (TUMS), Iran.

Materials and Methods

This study was conducted using a cross-sectional method. Patients including 100 individuals referring to the dental clinics affiliated to TUMS, comprised of 60 women (23 to 65 years old) and 40 men (18 to 57 years old) were also selected according to the inclusion criteria, namely, earache for more than six months or patients who had earache despite using medicines. As well, TMD patients were selected according to the Diagnostic Criteria for TMD (DC/TMD) Axis I and II Protocol. The diagnostic criteria included two parts: (1) Axis I for clinical diagnosis of TMD and (2) Axis II for investigating patients' psychological problems arising from pain [17,28]. So, Axis I was used to select the samples and to cover one or more of the following criteria: (a) mandibular movement limits (for investigating possible limitations), (b) crepitus, (c) mouth opening pattern, and (d) tenderness in temporalis, masseter, medial pterygoid, lateral pterygoid muscles, TMJ, coronoid process, and anterior and posterior mandible.

Physical Examination

Both patients' sides were touched in order to diagnose the pain, and they were asked to point out painful areas. To examine TMJ, the patients would open their mouths as far as they could so that the distance between the maxillary incisal edges and the mandible could be measured with a normal ruler. If the measurement was less than 40mm, the patients were diagnosed with opening limitations. Tenderness was also evaluated during the opening status, and crepitus was measured through touching with finger. The masseter, the lateral pterygoid, the temporalis, and the digastric and styloid muscles were also examined. Other examinations were associated with levels of stress, wherein patients were questioned using the DC/TMD Axis I Protocol through items including patient premonition, bodily shivers, sudden and unjustified fear, heartthrob, impatience and irritability, fear of the future, terrifying thoughts, and phantasms.

Statistical Analysis

This study numerically measured the frequency of TMD and also used independent t-test and Chi-square test to compare TMD patients in respect of age and

gender; respectively.

pain while clicking.

Results

This study evaluated 100 TMD patients referring to dental clinics affiliated to TUMS, Iran, including 40 males and 60 females. The participants aged at least 18 and maximum 65 years. According to the findings, the incidence rate of TMD was 64.6% in women and 35.4% in men, suggesting that earache and TMD were respectively 2.3 and 1.8 times more common in females than males. As well, 76.5% of the patients had anterior pain (namely, areas of TMJ pain) in the mandible, the temple, or the ears, which had on average started 30-46 months ago. Moreover, 27.5% of the patients used the term "pain-free", 59.8% of them opted for "recurrent pain," and 12.7% of the individuals employed the term "permanent pain" to describe their mandible, temple, or ear anterior pain in the past 30 days.

Additionally, 51% of these patients had suffered pain in the temporal area over the past month which had started 22 to 33 months ago on average. Chewing hard foods (33.3%), mouth opening or protrusive and laterotrusive movements (17.6%), habits such as tooth contact, grinding, clenching or chewing gum (28.4%), and talking, kissing or yawning (12.7%) had even worsened their pain in the temporal area. In response to the question of how patients would rate their worst TMJ pain over the past month (Visual Analogue Scale), 51% showed a number above average (number 5). The results of clinical examinations using DC/TMD Axis 1 Protocol are detailed in Table 1.

In this study all the patients had normal overjet and overbite. A total of 5 patients also had midline deviation with an average of 2.6mm to the left and 17 patients had midline deviation with an average of 0.82 mm to the right. Besides, 70.6% of the patients had normal opening pattern, 28.4% of them had corrected deviation opening pattern, and only 1% of the samples had shifted to the right when closing their mouths (Table 2).

Average painless mouth opening in patients was 43.78mm. This value for maximum and minimum opening with the help of the dentist was 48mm and 49.91mm; respectively (Figure 1). As well, 35.3% of the patients had felt a click in the right TMJ area when the mouth had been opened and closed including 10.8% of patients who had pain while clicking. Additionally, 32.4% of them had a click in the left TMJ during opening and closing of the mouth including 11.8% who had

Pain in muscles in last 30 days	Temporalis	Right: 33.3%
		Left: 33.3%
	Masseter	Right: 39.2%
		Left: 41.2%
Pain in Assisted mouth opening	Temporalis	Right: 25.5%
		Left: 26.5%
	Masseter	Right: 52%
		Left: 48%
	TMJ	Right: 58.8%
		Left: 54.9%
Pain in unassisted mouth opening	Temporalis	Right: 20.6%
		Left: 25.5%
	Masseter	Right: 51%
		Left: 45.1%
	TMJ	Right: 53.9%
		Left: 51%
Pain in right lateral movement	Temporalis	Right: 2.9%
		Left: 3.9%
	Masseter	Right: 38.2%
		Left: 33.3%
	TMJ	Right: 42.2%
		Left: 43.1%
Pain in left lateral movement	Temporalis	Right: 5.9%
		Left: 3.9%
	Masseter	Right: 36.3%
		Left: 34.3%
	TMJ	Right: 43.1%
		Left: 40.2%
Pain in protrusion	Temporalis	Right: %3.9
		Left: 4.9%
	Masseter	Right: 16.7%
		Left: 14.7%
	TMJ	Right: 38.2%
		Left: 38.2%
Pain in palpation	Posterior mandibular region	Right: 46.1%
		Left: 41.2%
	Submandibular region	Right: 15.7%
		Left: 22.5%
	Lateral pterygoid area	Right: 45.1%
		Left: 40.2%
	Temporalis tendon	Right: 41.2%
		Left: 35.3%

Table 1. Various examination results in patients.

	Opening pattern			
	Straight	Corrected deviation	Right deviation	Left deviation
Cases	70.6%	24.8%	1%	0%

Table 2. Frequency of different patterns of mouth opening in patients.

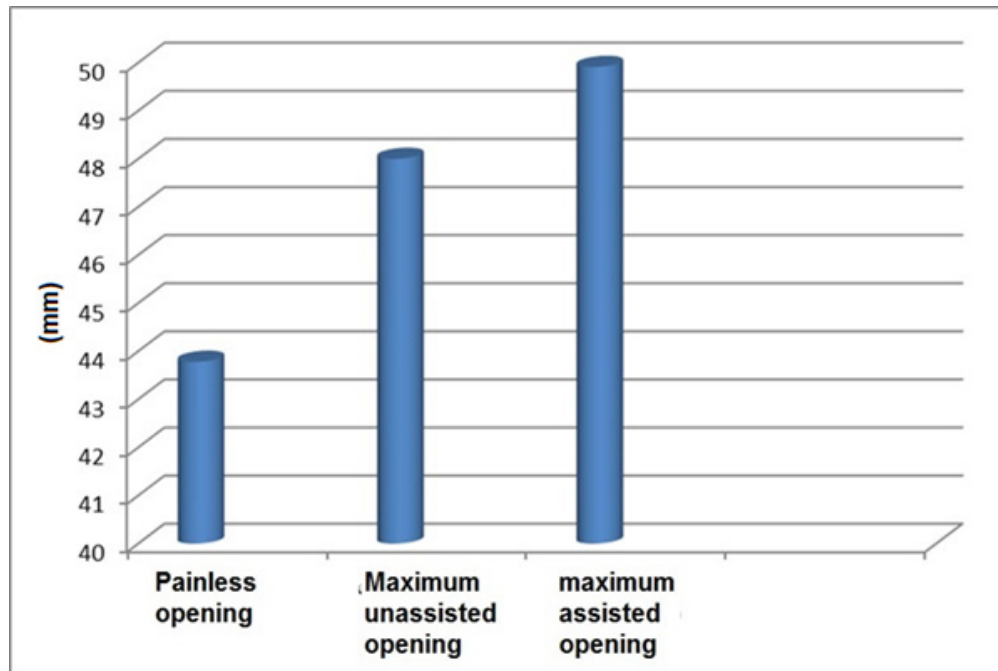


Figure 3. The mean value of mouth opening in patients.

Discussion

This study investigated the incidence rate (76.5%) of TMD in patients with earache which was consistent with the results of prior research. In this respect, Okeson had estimated the percentage of conservative TMD onset in general population by 50-60%, Solberg had reported the incidence rate of TMD by 76%, and Helkimohad valued it to be 88% for Finns and 60% for dental nurses [6,29]. The discrepancies in incidence rates of TMD in various studies might be due to different diagnostic criteria employed for finding the patients [30].

In some jaw movements, the mandibular condyle exerting pressure on auricular nerve which is close to the capsule of the TMJ triggers a painful process in the temporal region. Furthermore, the jaw and the ossicles in the middle ear are from the same embryologic origin, accounting for some malformations in the middle ear associated with changes in the mandible [27]. Kusdra et al. (2018) had also evaluated the relationship between otologic symptoms and TMD. As well, 87% of TMD patients had ear problems and tinnitus (42%), introduced as the most common symptoms [26].

Besides, Locker had reported the incidence rate of TMD in patients younger than 45 years old [28]. The results of the present study were consistent with the findings in previous research; however, age might have affected the incidence rates of TMD.

This study reported the incidence rate of TMD by 35% in men and 65% in women, and 1.8 times as many (almost twice) women with earache were subjected to TMD as men. In line with the present study, Pedroni (2003) had reported the incidence rate of TMD to be 4 times higher in women [31], suggesting gender as a variable affecting the incidence rate of TMD and earache. Furthermore, similar to the present study, Crystal (2010), Slade (2013), Sahler (2012), Rasmussen (1991), and Manfredini (2011) had also estimated the incidence rate of TMD and earache respectively by 45.3% and 32%. The highest incidence rate could be observed in the 30-40-year-old age group for TMD and those aged 30-39 years for earache. The incidence rate of myofascial TMD was also 3.3 times higher in women than in men. The statistical differences could be due to sample size differences, evaluation of specific types of earache or joint dysfunctions, or specific sample groups that could clearly demonstrate higher incidence rates

of earache and TMD [32]. Macedo et al. had also found a significant association between earache and TMD in the elderly. Moreover, 40.9% of the patients with earache had TMD [27]. Contrary to most studies, Yatani, List, and Gray had reported no difference in the incidence rate of TMD in terms of gender [28,33].

Consistent with results of the present study, Ariovaldo et al. (2014) had demonstrated that muscular dysfunctions had occurred in 55% of 92 headache patients, whereas, the value was approximately 66% for the incidence rate of earache in 100 TMD patients in the present study. The minor statistical difference could be as a result of dysfunction types. Furthermore, the average age of patients having headache in their investigation (i.e. 16-68 years old) was similar to that in the present study (namely, 18-65 years old). Although the incidence rate of chronic daily headache (CDH) was 92% for women and 8% in men in 92 patients referring to the Headache Institute, earache had appeared in 70% of women and 30% of men in this study. Therefore, the difference in statistical values could be attributed to variances in sample sizes, populations, and types of pain [34].

As well, Auerbach (2001) had investigated the role of psychological factors on incidence rate of muscle pain in TMD in 258 patients. The results of the present study suggested a direct correlation between emotional state and TMD, and it also implied that psychological factors had an important role in creating mandible pain with muscular origin, which could be reduced through behavioral interventions. Likewise, premonition, anxiety, and shivering had affected patients' TMD conditions, which were in agreement with the results reported by Auerbach et al [35].

Manfredini et al. (2004) had also used various psychopathological methods to investigate the relationship between mood and agoraphobia in various age groups of 131 TMD patients, using a standardized clinical examination. Mood and agoraphobia had been thus evaluated via two questionnaires, and the results had established a significantly higher incidence rate due to mood dysfunctions ($p < 0.001$) and agoraphobia ($p < 0.01$) in TMD patients compared with other healthy groups, but no difference might be by reason of small sample size in the present study ($p = 0.38$) [36].

Conclusion

The incidence rate of TMD was high in patients suffering from earache, and the results suggested that TMD in such patients needed to be considered and

evaluated by dentists and medics.

Conflict of Interest

There is no conflict of interest to declare.

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