

The Relationship between Temporomandibular Disorders (TMDs) and Overall Denture Conditions in Complete Denture Wearers

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Abstract

Introduction: The aim of this study was to investigate whether there is any relationship between the condition of complete dentures and TMDs.

Methods: The sample consisted of 61 consecutive patients (35 females and 26 males) who were admitted to the Department of Prosthodontics of Mashhad Faculty of Dentistry for fabrication of new complete dentures. The age range of the participants was between 32 and 80 years, with the mean age of 57.05 ± 10.26 years. The patients were examined by two prosthodontists. Using a questionnaire, the first prosthodontist asked the patients about their habits and history of trauma to the temporomandibular joints (TMJs). She then examined the participants for signs and symptoms of temporomandibular disorders (TMDs). The second prosthodontist examined each participant's existing denture and checked its fit, stability, retention, occlusion, and centric relation, and recorded how long it had been in service. The examination was double blind. The data were recorded in examination sheets. **Results:** The relationship between TMDs and denture fit, stability, retention, centric relation and occlusion was analyzed using Fisher's Exact Test. No significant relationship was found between denture characteristics and TMDs in complete denture wearers ($P\text{-value} > 0.05$). **Conclusion:** Complete denture characteristics did not play a role in the development of TMDs in edentulous patients.

Key words: Complete denture, edentulous patients, temporomandibular disorders.

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Introduction

"Temporomandibular disorders (TMDs) are a group of conditions characterized by pain or dysfunction in the temporomandibular joint (TMJ) and/or the muscles of mastication (1,2). Typical signs and symptoms of TMDs are facial pain, clicking or crepitus of the TMJs, limited jaw movement capacity, and deviation in the movement patterns of the mandible (3). "The most common complaint of patients with masticatory muscle disorders is muscle pain. Dysfunction is also a common clinical symptom associated with masticatory muscle disorders and is usually seen as a decrease in the range of mandibular movement (4). TMJ sounds, which are routinely recorded in subjects with suspected TMDs, are another important sign of TMDs (5,6).

TMDs have varying aetiology and pathology. General factors, such as impaired health, general joint and muscle diseases, psychological and psychosocial factors, and local influences such as occlusal disturbances and traumas, can exist in the background of TMDs (4). There is considerable evidence that biomedical or physical factors alone correlate poorly with TMDs (3,7,8).

The current consensus is that loss of teeth and lack of posterior occlusal support seem to have little association with TMDs (9,10). However, some believe that several oral and dental factors, including posterior

tooth loss, edentulism, and denture use, may be associated with TMD signs and symptoms. It has been suggested that edentulism may alter several angles and pressure relationships affecting TMJ mechanics (11).

The effect of denture condition on TMDs is controversial. One study found no statistically significant correlations between signs and symptoms of TMDs and denture retention, stability, occlusal disturbances, freeway space, age of present denture or the number of sets of dentures (12). However, some studies have shown that denture wearers have a higher prevalence of TMD symptoms compared to the normal population (13) or to those who still have natural teeth (14), and that the incidence and intensity of TMDs are higher in subjects with greater tooth loss in the supporting zones (15,16).

Complete tooth loss among the elderly is still frequent in developing countries (17), and alterations in the maxillo-mandibular relationship may be induced during the construction of complete dentures (18). As a result, the incidence of TMDs and the presence of lesions in the oral cavity are common findings in complete denture wearers (19-21).

A complete denture is considered inadequate when it is unstable, presents lack of retention, or when there is loss of vertical dimension to any extent, resulting from either incorrect manufacturing or wear of artificial teeth (12). The use of inadequate complete dentures is considered as a reason for the development of oral lesions, such as denture stomatitis, angular cheilitis, traumatic ulceration and inflammatory hyperplasia (22). It may also contribute to the development of TMDs. The aim of this study was to investigate the relationship between denture characteristics and TMDs in complete denture wearers.

Materials and Methods

The sample consisted of 61 consecutive patients (35 females and 26 males) who were admitted to the Department of Prosthodontics of Mashhad Faculty of Dentistry for fabrication of new complete dentures. The age range of the participants was between 32 and 80 years, with the mean age of 57.05 ± 10.26 years.

All the participants were examined by two prosthodontists. The first examiner used a questionnaire to inquire about patient habits, including bruxism, clenching, biting on foreign objects, gum chewing, placing their hands under their chin or one side of the face, and chewing food with only one side of the mouth. She also asked the participants about any history of trauma to the temporomandibular joints (TMJs) and examined them for signs and symptoms of TMDs including earache, pain on palpation in the muscles of mastication (masseter, temporal, pterygoid, digastric,

and sternocleidomastoid muscles), history of open or closed lock of the TMJs, repetitive joint displacement, and pain on function of the TMJs. Maximum mouth opening with and without pain was also measured and recorded.

The second prosthodontist examined the participants' existing (old) dentures and checked their fit, stability, retention, occlusion, and centric relation. Centric relation was evaluated using Dawson's bimanual technique (23). The method of denture evaluation was the same as that performed by MacEntee and Wyatt (24). According to the CODE index defined by these authors, "stability is considered unacceptable when a maxillary or mandibular denture is dislodged with light finger to a premolar, and retention is not enough when a denture is dislodged or loose when the lips are licked with the mouth open approximately 15mm". Regarding adequate occlusion, bilateral contact between two opposing posterior teeth is the cutoff for a functional natural or artificial dentition. Therefore less than two opposing molars or premolars bilaterally is considered as inadequate occlusion. Fit is acceptable when dentures are not loose on the underlying mucosa (24). The second examiner also recorded how long each participant had used his/her existing denture. The examination was double blind and each examiner was unaware of the results of the other. The results for each patient were recorded in examination sheets. Data were analysed using Fisher's Exact Test of the SPSS software.

Results

Sixty-five edentulous patients (26 males and 39 females) participated in our study. All participants had complete dentures. The results reported by the first examiner are summarized in tables 1-5.

There was no association between gender and patient habits, pain on palpation in the muscles of mastication, history of trauma to the TMJs, or type of TMD. Twenty-three patients were diagnosed with TMDs. The most common signs of TMDs were pain in the auricular region (reported by 12 participants) and pain during function of the TMJs (experienced by 11 patients).

Palpation of the muscles of mastication revealed that the muscles most frequently involved were the lateral pterygoids, which were painful in 17 patients, followed by the masseter in 10 patients. Maximum opening of less than 45mm, an indication of limited movement of the mandible, was observed in 15 patients without TMDs and 9 patients with TMDs.

The results obtained by the second examiner are demonstrated in figures 1-6. Age of existing dentures was analyzed between patients with and without TMD

with the use of Mann-Whitney U test. The result was a p-value greater than 0.05 (p=0.861) which indicates no significant difference between groups with and without TMD.

The relationship between TMDs and denture fit, stability, retention, centric relation and occlusion was

analyzed using Fisher's Exact Test and the P-values were 0.331, 0.379, 0.067, 0.456 and 0.744, respectively. Therefore no relationship was found between any of the mentioned factors and TMDs.

Table 1. Habits of patients, according to sex (P-values refer to Fisher's exact test between genders)

Habit	Sex	Male	Female	P-value
		N (%)	N (%)	
Bruxism		1(3.8)	2(5.1)	1.00
Clenching		4(15.4)	10(25.6)	0.324
Placing arm under chin or one side of face		0(0.0)	1(2.6)	1.00
Unilateral chewing		12(46.2)	16(41)	0.683

Table 2. History of trauma in patients, according to sex (P-values refer to Fisher's exact test between genders)

History of trauma	Sex	Male	Female	P-value
		N (%)	N (%)	
Positive		0(0.0)	6(15.4)	0.073
Negative		26(100.0)	33(84.6)	

Table 3. Pain on palpation in muscles of mastication, according to sex (P-values refer to Fisher's exact test between genders)

Muscle tenderness	Sex	Male	Female	P-value
		N (%)	N (%)	
Masseter		4(15.4)	6(15.4)	1.00
Temporal		3(11.5)	3(7.7)	0.676
Pterygoid		4(15.4)	13(33.3)	0.107
Digastric		1(3.8)	4(10.3)	0.640
Sternocleidomastoid		1(3.8)	3(7.7)	0.644

Table 4. Type of TMD according to sex (P-values refer to Fisher's exact test between genders)

Type of TMD	Sex	Male	Female	P-value
		N (%)	N (%)	
Muscular		6(23.1)	11(28.2)	0.645
Internal		0 (0.0)	1(2.6)	1.00
Combination		1(3.8)	4(10.3)	0.640

Table 5. Maximum mouth opening with/without pain in patients with/without TMD

Maximum opening TMD status (mean)	Without pain	With pain
	With TMD	41.04 mm
Without TMD	42.72 mm	47.40 mm

Table 6. Age of existing denture

	N	Mean	Std. Deviation	Minimum	Maximum	Median	P-value
With TMD	21	7.99	9.82	.15	40.00	3	0.861
Without TMD	40	8.13	7.86	1.00	31.00	5.5	

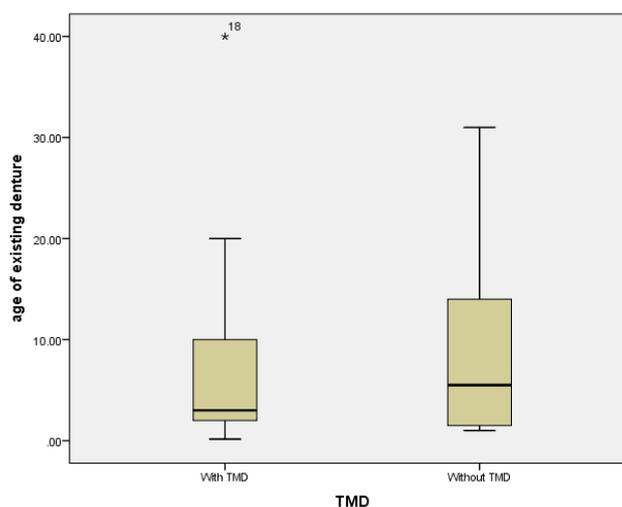


Figure 1. Boxplot of the age of the existing denture in patients with and without TMD

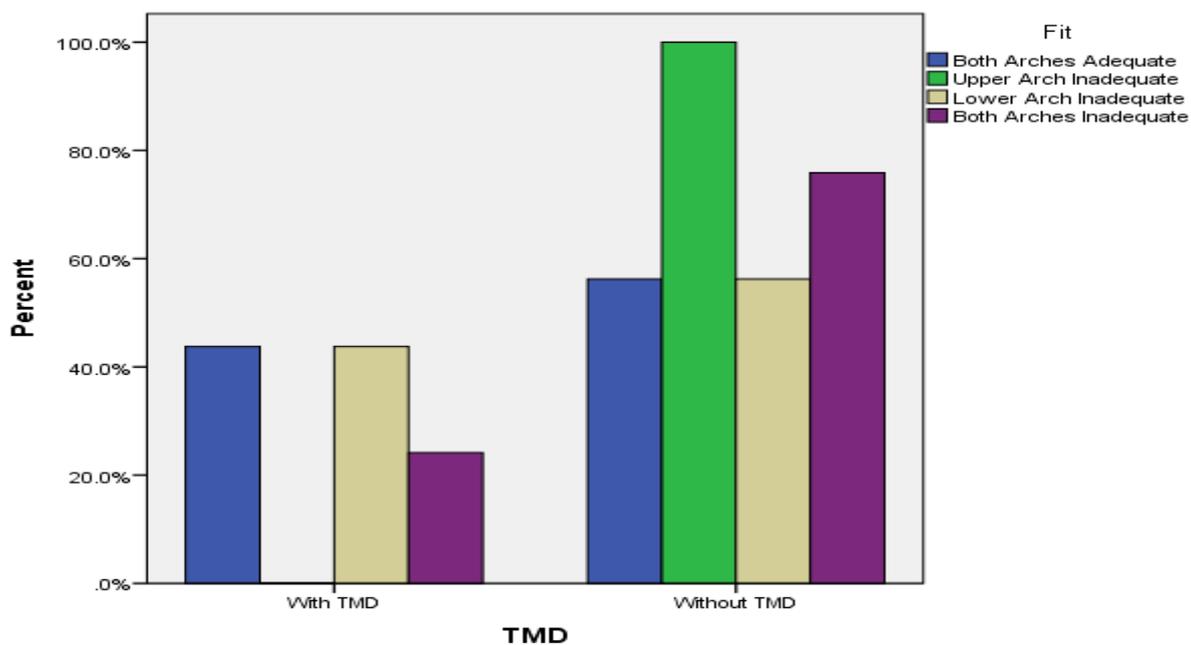


Figure 2. The fit of the existing dentures

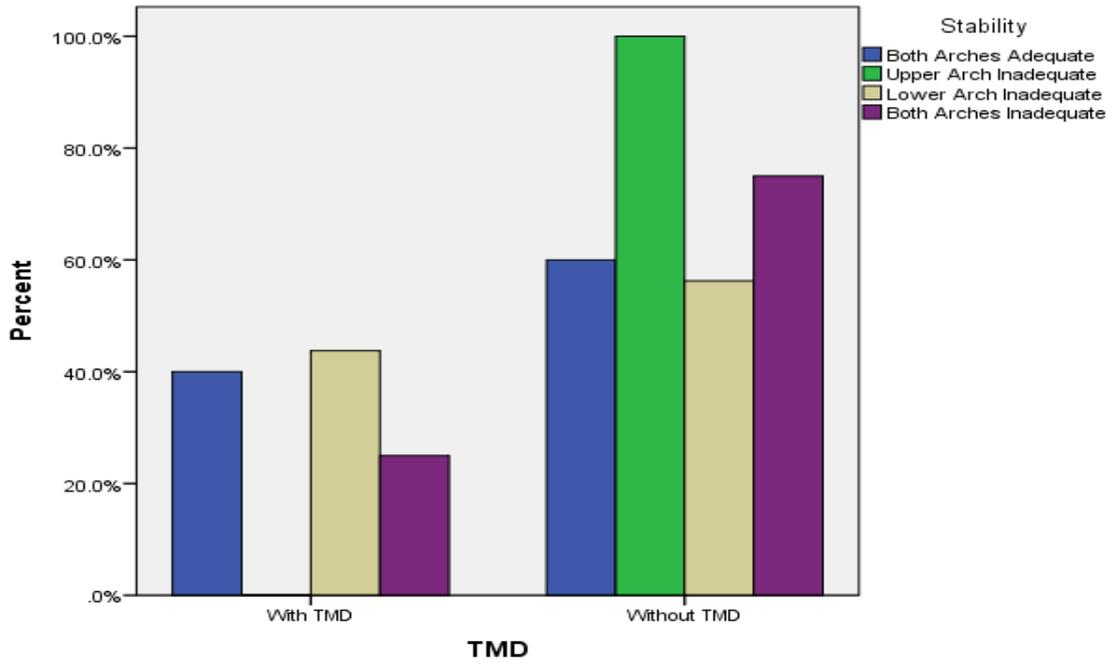


Figure 3. The stability of the existing dentures

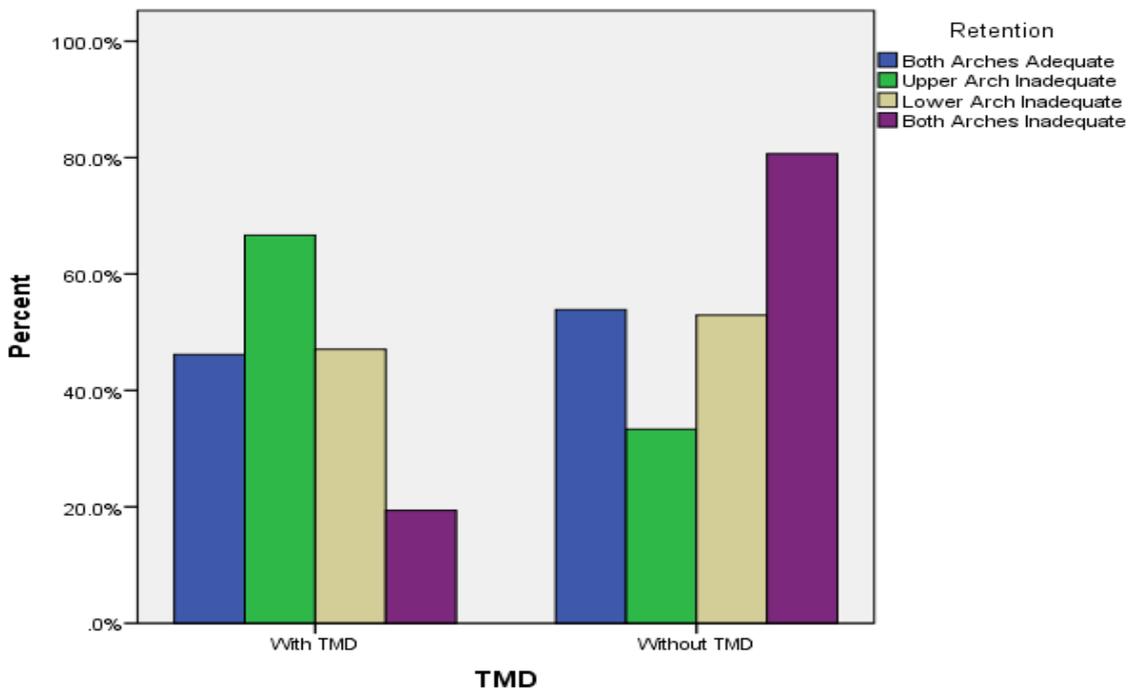


Figure 4. The retention of the existing dentures

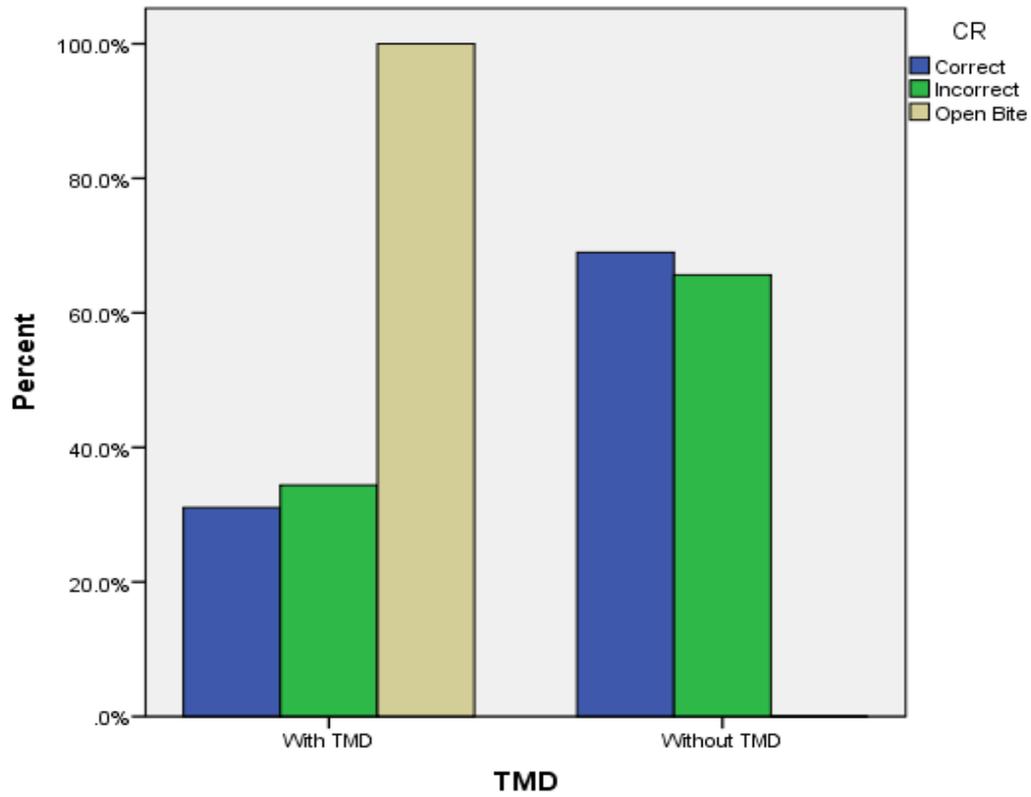


Figure 5. The centric relation of the participants' existing dentures

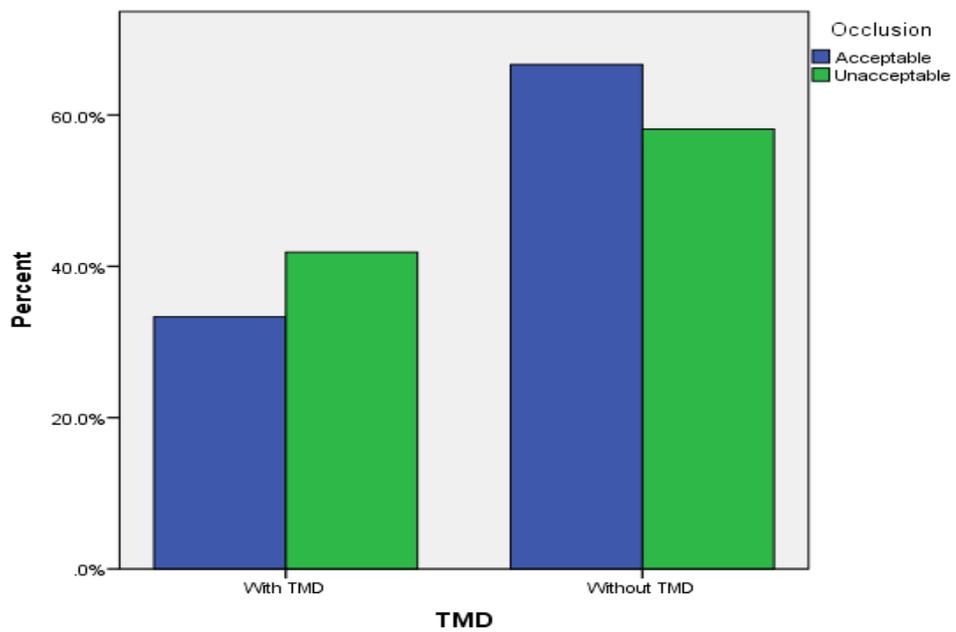


Figure 6. The occlusion of the existing dentures

Discussion

Studies concerning the relationship between the use of complete dentures in edentulous patients and TMDs are scarce. It has been suggested that factors that complicate the complete denture wear may also predispose patients to TMD symptoms (14).

Few epidemiological investigations have reported the signs and symptoms of TMDs in complete denture wearers. Some have found no correlation between certain characteristics of dentures (retention, stability, occlusal errors, freeway space, age of present denture, or number of sets of dentures) and the presence or severity of TMD signs and symptoms (9,12,25). However, in a study by Lundeen et al. (13) the relationship between denture wearing and symptoms of TMDs was assessed in 278 denture patients and denture wearers were found to have a higher prevalence of TMD symptoms than the normal population.

Szenpetery et al. (26) and Mercado and Faulkner (18) have reported a strong correlation between increase in the patient's age, complete denture wearing and TMD signs and symptoms.

According to Zissis et al. (27), Gibson (28), and Monteith (29), incorrect vertical dimension and centric relation are the most frequent causes of TMDs among complete denture wearers (12). However, Franks (30), Macentee (31), Wilding et al (32), and McCarthy et al (33) have concluded that discrepancies in vertical dimension of existing complete dentures does not affect the severity of TMDs (12). The results of our current study indicate no relationship between incorrect centric relation of complete dentures and TMDs.

Many studies have found no correlation between signs and symptoms of TMDs and factors relating to overall quality of the dentures and the occlusal status of the dentures (18,31,34-41). Complete dentures are not as resistant to deflective occlusal forces as natural teeth, and therefore dentures are able to shift without harming the muscles and TMJs (12). This might be an explanation for the results of our study, which indicate that factors such as retention, stability, fit, and occlusion of complete dentures, do not have any relationship with the development of TMDs.

Al-Jabrah and Al-Shumailan1 determined the prevalence of TMJ sounds in 100 completely edentulous patients wearing complete dentures with severe bone resorption and 100 patients wearing removable partial dentures. The patients wearing both full and removable partial dentures had a significantly higher prevalence of vibrations. Tenderness upon palpation in the periauricular region was the most common response in both groups. Patients with both complete and partial dentures showed higher tenderness and the masseter muscle was the most affected (1). According to the results of our examinations, the lateral pterygoid muscle

was the most commonly affected muscle in our patient population of complete denture wearers with TMDs followed by the masseter.

Some recent epidemiologic studies have reported more frequent and more severe TMD signs and symptoms in women than in men (42-45). This has led to interpretations such as "more women than men appear to seek treatment for TMD symptoms" (46,47). Some researchers also believe that this reflects biological, psychosocial, and hormonal differences between the two genders (48-50). However, epidemiological surveys show that signs and symptoms of TMD are present in both sexes in equal proportions (51). The results of our study show no significant difference in TMD signs and symptoms between the two genders and agree that both men and women are equally affected by TMDs.

A study by Dallanora et al on the prevalence of TMDs in a population of complete denture wearers revealed a positive association between the time of use of complete dentures and the presence of TMDs. According to their results, when the individual continuously wore the same complete dentures for more than 10 years, a higher prevalence of TMD symptoms was found (21). Our results, however, do not demonstrate any relationship between the age of the existing complete dentures and TMDs.

Conclusion

No relationship was found between complete denture characteristics, such as stability, retention, occlusion, fit, and centric relation, and TMDs in edentulous patients. Wearing complete dentures does not predispose edentulous individuals to TMDs.

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