Available online at *www.ujpronline.com*
Universal Journal of Pharmaceutical Research
An International Peer Reviewed Journal
ISSN: 2831-5235 (Print); 2456-8058 (Electronic)

RESEARCH ARTICLE

PREVALENCE OF SIGNS OF TEMPOROMANDIBULAR DISORDERS IN HEALTHY ASYMPTOMATIC COMPLETELY EDENTULOUS INDIVIDUALS AND THE EFFECT OF DENTURE ON TEMPOROMANDIBULAR DISORDERS

Maha'a A. M. Al-Khorasani[1], Abbas M Al-Kebsi[1], Maged Sultan Al-Hammadi[2], Amani Hussein Y Al-hamzi[3], Nesreen F. Al-Sanabani[1], Khaled A AL-Haddad[4], Mohammed Mohammed Ali Al-Najhi[4,5], Hassan Abdulwahab Al-Shamahy[5,6], Taghreed Ahmed M Al-Kibsi[7]

[1]*Prosthodontics Department, Faculty of Dentistry, Sana'a University, Yemen.*
[2]*Orthodontics and Dentofacial Orthopedics, Department of Preventive Dental Sciences, College of Dentistry, Jazan University, Jazan 45142, Saudi Arabia.*
[3]*Department of Basic Sciences, Faculty of Dentistry, Sana'a University, Republic of Yemen.*
[4]*Orthodontics, Pedodontics and Prevention Department Faculty of Dentistry, Sana'a University, Yemen.*
[5]*Orthodontics, Pedodontics and Prevention Department Faculty of Dentistry, Genius University for Sciences & Technology, Dhamar city, Republic of Yemen.*
[6]*Medical Microbiology department, Faculty of Medicine, Genius University for Sciences & Technology, Dhamar city.*
[7]*Department of Oral and Maxillo-Facial Surgery, Faculty of Dentistry, Sana'a University, Republic of Yemen.*

Article Info:

Article History:
Received: 6 December 2022
Reviewed: 9 January 2023
Accepted: 24 February 2023
Published: 15 March 2023

Cite this article:
Al-Khorasani MAM, Al-Kebsi AM, Al-Hammadi S, Al-hamzi AHY, Al-Sanabani NF, AL-Haddad KA, Al-Najhi MMA, Al-Shamahy HA, Al-Kibsi TAM. Prevalence of signs of temporomandibular disorders in healthy asymptomatic completely edentulous individuals and the effect of denture on temporomandibular disorders. Universal Journal of Pharmaceutical Research 2023; 8(1):28-34.
https://doi.org/10.22270/ujpr.v8i1.894

***Address for Correspondence:**
Dr. Hassan A. Al-Shamahy, Faculty of Medicine and Heath Sciences, Sana'a University. Faculty of Medicine, Genius University for Sciences and Technology Dhamar/Sana'a, Yemen; Tel: +967-1-239551.
E-mail: *shmahe@yemen.net.ye*

Abstract

Background and objectives: Temporomandibular disorders (TMD) are a multi-factorial issue characterized by signs and symptoms that eventually restrict or may impede an edentulous patient's physiological activity. The current study aimed to ascertain the prevalence of TMD among edentulous individuals, and their association with risk factors such as gender, age, educational level, habitual Khat chewing, economical status, duration of edentulousness, the age, and vertical dimension of occlusion (OVD) of the present dentures.
Materials and Methods: This study involved a thorough evaluation of 400 edentulous Yemeni patients who were undergoing prosthetic treatment at the Faculty of Dentistry Sana'a University and the University of Sciences and Technology, 114 with denture and 286 without denture. This evaluation of TMD signs and symptoms was performed using the Helkimo index. The outcomes were analyzed by correlating the research variables and the prevalence of signs and symptoms of TMD using chi-squared tests.
Results: The study's findings showed that signs and symptoms of TMD were 82.5% and 55.3% among complete denture wearers and 80.4% and 49.0% among non-denture wearers, respectively. Furthermore, the most frequent sign and symptom was the joint sounds. This study revealed a statistically significant association between the prevalence of TMD symptoms and patient gender and between TMD signs and symptoms and OVD in denture wearers.
Conclusion: The current study supports the need to evaluate the potential impact of TMD on completely edentulous individuals and to take caution while receiving dental therapy and prosthetic rehabilitation.
Keywords: Denture wearers, prevalence, signs, symptoms, Temporomandibular disorders, TMD, Yemen.

INTRODUCTION

The signs and symptoms of Temporomandibular disorders (TMD) can influence a patient's physical function and emotional well-being as well as their health-related quality of life. Because of the large number of persons affected, TMD is becoming a major health concern[1]. TMD refers to a set of musculoskeletal and neuromuscular diseases that affect the Temporomandibular joint (TMJ), the masticatory muscles, and surrounding tissues[2]. Numerous risks factors, including teeth loss, aging, gender, para-functional habits, a defective prosthesis (incorrect centric relation and vertical dimension), psychological

factors, and traumatic injury to TMJ, and even, can affect the joint function in completely edentulous individuals[3,4]. TMD can cause several different signs and symptoms including headache, pain around the joint, pain that worsen with mouth opening, muscles tenderness, difficulties in mouth opening, and joint sounds (crepitus and clicking)[5]. In developing countries, completely losing teeth in the elderly is common[6]. Many edentulous patients who do not report experiencing TMJ problems may exhibit one or more signs upon random examination[4]. The relationship between tooth loss and TMD in most literature surveys is still in for discussion. However, numerous studies have revealed a direct association between them[7]. There are many studies in the literature surveys showed a frequent prevalence of TMD in general populations[8], and in the edentulous population[3,9-11]. Edentulous individuals do not exhibit symptoms to the same degree as those who have natural dentition; however, few studies revealed that TMD symptoms were more common in denture wearers than in the population with natural teeth[12]. According to Choy and Smith, people with dentition exhibit more TMD symptoms than individuals with completely missing teeth[13].

As the number of complete dentures (CD) wearers increases, a dental professional must be aware of the effect of denture status on the anatomical and functional integration of the TMJ. The denture quality and denture-wearing habits correlated to the TMD's signs and symptoms[14]. Additionally, it asserted that the most common causes of TMD were improper vertical dimension (VD) and centric relation (CR)[14]. There have been an increasing number of publications in recent years concerning the need to examine individuals with edentulism who require prosthodontic rehabilitation and to look for the presence of TMD[15].

This study aims to assess the prevalence of signs and symptoms of TMD in a sample of completely edentulous Yemeni patients who visit the Prosthodontics Department, Faculty of Dentistry, Sana'a University and University of Sciences and Technology, Sana'a City.

MATERIALS AND METHODS

Sample Size: The equation shown below was used to calculate the sample size:

$$n=z^2. P(1-p)/e^2$$

Where; n=desired sample size, *p*=estimated proportion of the outcome in the target population.

Unfortunately, no pervious study was conducted to evaluate the TMD among Yemeni edentulous individuals. So, the sample size was estimated by using results of a previous study in Saudi Arabia[3] in which the frequency of TMD in completely edentulous individual was 60.5%.

e=maximum size of standard error. It will be set as 5%

z=number of standard deviations=1.96 for 95% confidence level (CI).

$$n=(1.96)2\times(0.605)\times(1- 0.605)/(0.05)2=367 \approx 400$$

Sampling Method: A sample of 400 completely edentulous Yemeni patients (314 males and 86 females) Aged between 30 and 90 years presented to the dental clinic for the Prosthodontic Department at the Faculty of Dentistry, Sana'a University, and the Faculty of Dentistry, University of Sciences and Technology were evaluated using the fish bowl sampling method.

Inclusion Criteria: All Completely edentulous Yemeni patients requiring prosthetic rehabilitation. The sample participants aged between 30 and 90 years.

Exclusion Criteria: Patients with a single CD with opposing natural teeth or partially edentulous arches. Patients who had been already diagnosed and treated as symptomatic TMD patients. The completely edentulous patients should have no history of any symptoms of TMD before teeth loss. Patients with a history of trauma or degenerative arthritis or surgical treatment in the craniofacial region.

Clinical examination, Data Collection and Analysis: An interview and clinical examination were used to obtain the data through the Helkimo Anamnestic index (Ai) and Clinical Dysfunction index (Di). The oral interview was utilized instead of a questionnaire because it could confirm the identity of interviewed patients and determine whether the questions were understood. Tenderness, clicking, crepitus of the TMJ, musculatures, the maximum mouth opening, and pathway of mandibular opening were determined. The examiner underwent adequate training and calibration exercise before collecting data to aid in proper diagnosis, thus to avoid selection bias. Weekly training session over a 6-month period was undertaken by the examiner. The training comprised oral presentation, discussion, and clinical evaluation of patients under the supervision and guidance of experienced staff of oral diagnosis.

Statistical analysis: The results obtained were analyzed using Statistical Package for Social Sciences. Software (SPSS version 20.0, SPSS IBM, New York, NY). Statistical analyses were performed using Chi-square test. Statistical significance was set at $p<0.05$.

Ethical Consideration: Ethical approval for this study, No: 37 dated January 23, 2021 were obtained from the Medical Ethics and Research Committee of the Faculty of Dentistry, Sana'a University. All procedures were according to the ethical guidelines of the review committee.

RESULTS

The study included 400 patients, 78.5% males and 21.5% females, 114 denture wearers and 286 non-denture wearers. Considering the incidence of TMJ symptoms among denture-non-wearers (NDW) and denture-wearing (DW) patients; TMJ sounds were the most common symptom in NDW patients (39.9%) and in DW patients (43.9%) with an associated odds ratio in DW equal to 3.1, $p<0.001$. The second most frequent symptom was pain in the Temporomandibular joint or masticatory muscles which amounted to 12.9% in NDW versus 9.6% in DW but the difference between the two group was not significant ($p=0.36$). The second most frequent symptom was pain on movement, 9.1% in NDW versus 7.9% in DW, but the

difference between the two groups was not significant (p=0.7). Other symptoms were less frequent as stiffness (0.7% in NDW vs. 1.8% in DW), fatigue (3.8% NDW vs. 5.3% in DW), and difficulty opening the mouth (1.4% NDW vs. 2.6% in DW), locking (2.1% in DW vs. 5.3% in DW) and dislocation (luxation) (0.7% NDW vs. 0.0% in DW) (Table 2). Considering the association of clinical signs of TMD in dentures patients and patients without dentures according to the Clinical Dysfunction Index (Di), open range of motion was impaired in 5.6% of NDW patients versus 11.4% in DW with *OR* equal to 2.1, p=0.04 in DW patients; TMJ dysfunction occurred in 75.9% of NDW versus 78.1% in DW patients.

Myalgia (muscle pain tenderness) occurred in 18.9% of NDW versus 13.2% in DW patients, TMJ pain tenderness occurred in 6.6% of NDW VS 3.5% in DW patients, pain on movement of the mandible occurred in 9.1% of NDW versus 4% in DW patients (Table 3). In DW patients 55.3% showed Ai I and Ai II mild and severe Temporomandibular disorder (Table 4).

Table 1: Characteristics of the study sample, (n=400).

Characteristics		Frequency (%)
Gender	Males	314 (78.5)
	Females	86 (21.5)
Education level	No education	287 (71.8)
	Primary school	52 (13)
	Secondary school	28 (7.0)
	University	33 (8.2)
Socioeconomic level	Low	321 (80.2)
	Middle	76 (19)
	High	3 (0.8)
Khat chewing	Yes	283 (70.8)
	No	117 (29.2)
Denture	Yes	114 (28.5)
	No	286 (71.5)

In DW patients 82.5% showed Di I, Di II, Di III mild to severe Temporomandibular dysfunction according to clinical dysfunction index (Table 5).

Table 2: Association of symptoms of TMD in study sample according to Ai in denture and non-denture patients.

Symptom	Non-denture wearers n (%)	Denture wearers n (%)	OR	*p*
Stiffness	2 (0.7)	2 (1.8)	2.5	0.33
Fatigue	11 (3.8)	6 (5.3)	1.3	0.5
Difficult mouth opening	4 (1.4)	3 (2.6)	1.9	0.39
Locking	6 (2.1)	6 (5.3)	2.6	0.09
TMJ sounds	114 (39.9)	50 (43.9)	3.1	<0.001
Pain in the TMJ or masticatory muscles	37 (12.9)	11 (9.6)	0.7	0.36
Pain on movement	26 (9.1)	9 (7.9)	0.87	0.7
Luxation	2 (0.7)	0 (0)	un	0.3

Un=undefined, The Helkimo Anamnestic index (Ai)

Table 3: Association of clinical signs of TMD in denture and non-denture patients according to clinical Dysfunction index (Di).

		Non-denture wearer N (%)	Denture wearer N (%)	OR	*p*
Range of opening movement	Normal range	270 (94.4)	101 (88.6)	0.46	0.04
	Impaired	16 (5.6)	13 (11.4)	2.1	0.04
TMJ function	Normal TMJ function	69 (24.1)	25 (21.9)	0.89	0.64
	TMJ dysfunction	217 (75.9)	89 (78.1)	1.1	0.64
Muscle pain	No tenderness	232 (81.1)	99 (86.8)	1.5	0.17
	Tenderness	54 (18.9)	15 (13.2)	0.51	0.24
TMJ pain	No tenderness	267 (93.4)	110 (96.5)	2.7	0.05
	Tenderness	19 (6.6)	4 (3.5)	0.36	0.05
Pain on movement of the mandible	No pain	260 (90.9)	110 (96.5)	0.7	0.29
	Pain on movements	26 (9.1)	4 (4)	0.36	0.05

Clinical Dysfunction index (Di).

47.3% of male patients in NDW showed Ai I and Ai II (mild to severe Temporomandibular disorder), while female patients showed a slightly higher rate (54.5%). 50% of the male patients on DW showed Ai I and Ai II (mild and severe Temporomandibular disorder), while the female patients showed a very high rate of 80% with an associated odds ratio of 4 times compared to male patients (p=0.01) (Table 6). In male patients from NDW 79.5% of patients showed Di I, Di II and Di III (mild to severe temporomandibular dysfunction) while female patients had a higher incidence of Di I, Di II and Di III (83.3%) with an odds ratio concomitant equal to 1.2 but the outcome was not significant (p=0.49) (Table 7). In male DW patients 80.9% of patients showed Di I, Di II and Di III while female patients had a higher incidence of Di I, Di II and Di III (90%) with an associated odds ratio equal to 2.1 for females but the result was not statistically significant (p=0.32) (Table 7). In NDW age group patients the temporomandibular disorders Ai I and Ai II ranged from 47.7% to 54.5% and these differences between age groups were not statistically significant (Table 8).

Table 4: Distribution of TMD symptoms according to Ai among denture wearer patients.

		Denture wearers N (%)	Non-Denture wearers N (%)
Anamnesis Index	Ai 0	51 (44.7)	146 (51.0)
	Ai I, Ai II	63 (55.3)	140 (49)
	Total	114 (100)	286 (100)

Ai I+ TMJ sounds, Fatigue in the jaws, Stiffness in the jaws on awakening or on movement of the lower jaw.
Ai II=Diffi culties in opening mouth wide, Locking, Luxations, Pain on movement of the mandible Pain in the region of the TMJ or masticatory muscles.

Table 5: Distribution of TMD clinical signs according to Di in denture wearer patients.

		Denture wearing	
		Denture wearers	Non-Denture wearers
		N (%)	N (%)
Clinical Dysfunction Index	Di 0	20 (17.5)	56 (19.6)
	Di I, Di II, Di III	94 (82.5)	230 (80.4)
	Total	114 (100)	286 (100)

Clinical dysfunction index based on clinical examination (DI). Di 0= Clinically symptom-free, Di I=Mild dysfunction, Di II=Moderate dysfunction, Di III=Severe dysfunction.

Whereas in patients of the DW age group temporomandibular disorder Ai I and Ai II were very high in the age group 46-60 years the rate was 60% with the associated *odds ratio* equal to 3.1 times and p=0.003 (Table 8). In the age groups of NDW patients, the ranges for Di I, Di II, and Di III ranged from 79.1% to 85.7% with outcome differences being non-significant as p-values greater than 0.05 (Table 9). In DW 76-90 years a higher rate of Di I, Di II, Di III (90.9%) was recorded with an associated odds ratio of 2.3 for this age group but the result was not statistically significant because p was 0.43 (Table 9).

Table 6: Association between TMD symptoms (based on Ai) and gender of the patients.

		Helkimo Anamnestic index		OR	*p*
		Ai 0	Ai I, Ai II		
		N (%)	N (%)		
Non-denture wearer	Males	116 (52.7)	104 (47.3)	0.7	0.29
	Females	30 (45.5)	36 (54.5)	1.3	0.29
Denture wearer	Males	47 (50.0)	47 (50.0)	0.2	0.01
	Females	4 (20.0)	16 (80.0)	4	0.01

Ai I+TMJ sounds, Fatigue in the jaws, Stiffness in the jaws on awakening or on movement of the lower jaw.
Ai II=Difficulties in opening mouth wide, Locking, Luxations, Pain on movement of the mandible Pain in the region of the TMJ or masticatory muscles

Table 7: Association between TMD signs (based on Di) and gender of the patients.

		Clinical Dysfunction Index		OR	*p*
		Di 0	Di I, Di II, Di III		
		N (%)	N (%)		
Non-denture wearer	Males	45 (20.5)	175 (79.5)	0.77	0.49
	Females	11 (16.7)	55 (83.3)	1.2	0.49
Denture wearer	Males	18 (19.1)	76 (80.9)	0.48	0.34
	Females	2 (10.0)	18 (90.0)	2.1	0.32

Clinical dysfunction index based on clinical examination (DI). Di 0=Clinically symptom-free, Di I=Mild dysfunction, Di II=Moderate dysfunction, Di III=Severe dysfunction.

DISCUSSION

Based on the findings of Ai in the present study, the prevalence of TMD symptoms in denture wearers was 55.3% (Table 4) and in non-denture wearers was 49.0% (Table 4). Moreover, based on the findings of Di, the prevalence of TMD signs was 82.5% of denture wearers, and 80.4% of non-denture wearers (Table 5). TMD prevalence was high in edentulous people in this study because they frequently have para-functional habits, unstable prosthesis, impaired masticatory function[16], and increasing in emotional stress brought on by a loss of natural teeth is considered a contributing factor in the development of TMD[17]. The Yemeni population is not interested in seeking treatment unless symptoms are present, which may explain the variations between the prevalence of signs and symptoms in both denture wearers and non-denture wearers. It was found that these results agreed with the results from previous studies of different populations[3,9] which reported that more than 50% of edentulous individuals had TMD related problems. When compared with the findings obtained by Al-Shumailan and Almonaser[18] (14.3%), Shi and Wang[19] (43.2%), Divaris *et al.*,[20] (11%) and Jandial *et al.*,[9] (14.3%), the findings did not agree with the current study result. These differences in findings were explained by Carlsson, who found that older people exhibited a higher incidence of osteoarthritis. Individuals, who suffer from osteoarthritis, have been shown in the

literature to have a high prevalence of TMD[21]. Along with aging and tooth loss, psychological and emotional variables also play a role[18,22]. Also, variations in TMD prevalence between studies may be brought about by using distinct study methods, various populations, and variable sample sizes. According to the present study, the most prevalent sign and symptom in denture wearers (43.9%) and non-denture wearers (39.9%) is TMJ sounds (Table 2). This result agreed with the findings from previous studies[19,23]. Shi and Wang[19] reported that the prevalence of joint sounds among 352 edentulous subjects was 34.1% which was the most predominant sign. Joint clicking (61.0%) was also more prevalent than TMJ pain (50.0%) in a study by Zaki *et al.*,[10].

Table 8: Association between TMD symptoms (based on Ai) and age of the patients.

	Age	Helkimo anamnestic index		OR	*p*
		Ai 0	Ai I, Ai II		
		N (%)	N (%)		
Non-denture wearer	30-45 years	10 (45.5)	12 (54.5)	1.2	0.92
	46-60 years	68 (50.7)	66 (49.3)	1.0	0.92
	61-75 years	57 (52.3)	52 (47.7)	0.92	0.74
	76-90 years	11 (52.4)	10 (47.6)	0.9	0.89
Denture wearer	30-45 years	5 (50.0)	5 (50.0)	1.3	0.72
	46-60 years	20 (40.0)	30 (60.0)	3.1	0.003
	61-75 years	21 (48.8)	22 (51.2)	1.5	0.28
	76-90 years	5 (45.5)	6 (54.5)	1.5	0.49

Ai I+ TMJ sounds, Fatigue in the jaws, Stiffness in the jaws on awakening or on movement of the lower jaw.
Ai II= Diffi culties in opening mouth wide, Locking, Luxations, Pain on movement of the mandible Pain in the region of the TMJ or masticatory muscles.

This study differed from several previous ones[3,9,11] in which joint noises were not the most frequent finding in patients with complete dentures. In addition, the anomalous condylar surface is linked to joint sounds in completely edentulous patients[24] due to its association with degenerative disease of the articular surfaces, which is increased by aging. Anxiety in dentulous and edentulous is a common element that should be considered. Jaw clenching, which results in overuse and exhaustion of the masticatory muscles, can be brought on by tension and stressful conditions. These situations are likely the cause of TMD in denture wearers. In 47.3% of male patients in NDW (Non-denture wearers) showed Ai I and Ai II, while female patients showed a slightly higher rate (54.5%); also 50% of the male patients on DW (denture wearers) showed Ai I and Ai II, while the female patients showed a very high rate of 80% with an associated odds ratio of 4 times compared to male patients (p=0.01) (Table 6).

Table 9: Association between TMD signs (based on Di) and age the patients.

	Age	Clinical Dysfunction Index		OR	*p*
		Di0	Di I, Di II, Di III		
		N (%)	N (%)		
Non-denture wearer	30-45 years	4 (18.2)	18 (81.8)	1.1	0.86
	46-60 years	28 (20.9)	106 (79.1)	0.8	0.59
	61-75 years	21 (19.3)	88 (80.7)	1.29	0.55
	76-90 years	3 (14.3)	18 (85.7)	1.3	0.16
Denture wearer	30-45 years	2 (20.0)	8 (80.0)	0.83	0.83
	46-60 years	10 (20.0)	40 (80.0)	0.74	0.54
	61-75 years	7 (16.3)	36 (83.7)	1.2	0.78
	76-90 years	1(9.1)	10 (90.9)	2.3	0.43

Clinical dysfunction index based on clinical examination (DI). Di 0= Clinically symptom-free, Di I=Mild dysfunction , Di II=Moderate dysfunction, Di III=Severe dysfunction.

Obtained demographic data findings showed a difference in gender (314 males versus 36 females), and this difference was attributed to the general habits of females who tend to pay more attention to their health[20]. Also, in male patients from NDW 79.5% of patients showed Di I, Di II and Di III (mild to severe temporomandibular dysfunction) while female patients had a higher incidence of Di I, Di II and Di III (83.3%) with an odds ratio concomitant equal to 1.2 but the outcome was not significant (p=0.49) (Table 7). In male DW patients 80.9% of patients showed Di I, Di II and Di III while female patients had a higher incidence of Di I, Di II and Di III (90%) with an associated odds ratio equal to 2.1 for females but the result was not statistically significant (p=0.32) (Table 7). Gender had a significant effect on signs and symptoms of TMD among non-denture wearers and symptoms of denture wearers. These results were in agreement with several previous studies[10,19,23] however, they were not in agreement with other previous studies by Dallanora *et al.*, AlZ area, and Samara and Singh[3,11,25] in which equal rate in both sexes were occurred. TMD are most likely to develop in patients who are depressed[26].

To understand the epidemiological behavior of TMD, it is essential to examine the prevalence of TMD over a range of age groups. In the current study, in NDW age group patients the temporomandibular disorders Ai I and Ai II ranged from 47.7% to 54.5% and these

differences between age groups were not statistically significant (Table 8). Whereas in patients of the DW age group temporomandibular disorder Ai I and Ai II were very high in the age group 46-60 years the rate was 60% with the associated odds ratio equal to 3.1 times and p=0.003 (Table 8). The results are consistent with the findings of previous studies showing TMD risk rise with age[18,22,27]. Meanwhile, the results of the current study showed that the prevalence of TMD symptoms decreases in non-denture wearers with increased age which agreed with Zakir *et al.*,[10] study that found a high prevalence of TMJ problems in the age group 41-50 years (29.0%) whereas least prevalent (3.0%) in the age group 81-90 years[10]. Regarding the association between age and the signs of TMD, the current investigation did not find any conclusive evidence of such an association. A similar finding was reported by Samra and Singh[11].

Limitations of the study

There has been an increasing number of publications in recent years in Yemen regarding dental problems as well as the study of oral microorganisms and their sensitivity towards antibiotics, etc[28-45] but the need to screen individuals with irregular teeth who need prosthodontic rehabilitation and to look for the presence of TMJ disorders has be limited or non-existent. So, further investigations with calculation of sample size and using diagnostic research criteria to assess prevalence and severity of TMD among Yemeni population are needed before a final conclusion can be drawn.

CONCLUSIONS

TMD serve as a noteworthy reason for non-odontogenic pain in the orofacial location and are thought to be a subclass of musculoskeletal dysfunctions including tissue damage secondary generation of disproportionate force or pressure. The present study showed a high prevalence of signs of TMD in healthy asymptomatic completely edentulous individuals. The gender and age differences were statistically significant. The most common finding was limitation on mouth opening and the common finding was joint noises (crepitus and clicking). The current study supports the need to evaluate the potential impact of TMD on completely edentulous individuals and to take caution while receiving dental therapy and prosthetic rehabilitation.

ACKNOWLEDGEMENTS

The authors thank the Faculty of Dentistry, Sana'a University, Sana'a, Yemen for their generous support.

CONFLICT OF INTEREST

No conflict of interest associated with this work.

AUTHOR'S CONTRIBUTIONS

This research is part of a master's degree in the Prosthodontics Department, Faculty of Dentistry, Sana'a University, Yemen. **Al-Khorasani MAM:** writing original draft, methodology. **Al-Kebsi AM:** investigation, formal analysis, conceptualization. **Al-Hammadi S:** editing, methodology. **Al-hamzi AHY:** formal analysis, conceptualization. **Al-Sanabani NF:** writing, review. **AL-Haddad KA**: editing, methodology. **Al-Najhi MMA:** methodology, investigation. **Al-Shamahy HA:** supervision, review. **Al-Kibsi TAM:** formal analysis. Final manuscript was read and approved by all authors.

DATA AVAILABILITY

Data will be made available on reasonable request.

REFERENCES

1. Shaffer SM, Brismée JM, Sizer PS, Courtney CA. Temporomandibular disorders. Part 1: anatomy and examination/diagnosis. J Man Manip Ther 2014 Feb; 22(1):2-12. *http://dx.doi.org/10.1179/2042618613Y.0000000060*
2. Okeson J. The American Academy of orofacial pain: orofacial pain guidelines for assessment, diagnosis, and management 1996. Quintessence Publishing Co. Inc., Chicago, 113-184.
3. AlZarea BK. Prevalence of temporomandibular dysfunction in edentulous patients of Saudi Arabia. J Int Oral Health 2017; 9:1-5. *https://www.jioh.org/text.asp?2017/9/1/1/201091*
4. Hashemipour MA, Moslemi F, MIrzadeh A, Mirzadeh A. Parafunctional habits and their relationship with temporomandibular joint disorders in Iranian school students. Meandros Med Dental J 2018; 19: 247. *http://dx.doi.org/10.4274/meandros.41636*
5. Singh V, Sudhakar K, Mallela KK, Mohanty R. A review of temporomandibular joint-related papers published between 2014–2015. J Korean Assoc Oral Maxillofac Surg 2017; 43(6):368-372.*http://dx.doi.org/10.5125/jkaoms.2017.43.6.368*
6. Ettinger R. Oral health needs of the elderly--an international review. Commission of Oral Health, Research and Epidemiology Report of a Working Group. Int Dent J 1993 Aug; 43(4):348-54. PMID: 8276519.
7. Sipilä K, Suominen AL, Alanen P, Heliövaara M, Tiittanen P, Könönen M. Association of clinical findings of temporomandibular disorders (TMD) with self-reported musculoskeletal pains. Eur J Pain 2011 Nov; 15(10):1061-7. *http://dx.doi.org/10.1016/j.ejpain.2011.05.001*
8. Schmitter M, Rammelsberg P, Hassel A. The prevalence of signs and symptoms of temporomandibular disorders in very old subjects. J Oral Rehabil. 2005 Jul;32(7):467-73. *http://dx.doi.org/10.1111/j.1365-2842.2005.01449.x*
9. Jandial S, Ggupta R, Sharma S, *et al*. Prevalence of temporomandibular disorders in patients wearing complete dentures visiting prosthodontics department, Indira Gandhi Government Dental College, Jammu. Int J Prevent Public Health Sci 2017; 3, 35-37.
10. Zakir A, Shah MU, Iqbal M, Yasser F, Hussain MW, Riaz A. Frequency of signs and symptoms of Temporomandibular joint problems in completely Edentulous patients. Isra Med J 2020; 12(1): 17-21. *http://dx.doi.org/10.17354/ijpphs/2016/70*
11. Samra A k, Singh, G. Different temporomandibular joint disorders and its prevalence in complete dentures patients: An observational study. Int J App Dental Sci 2021; 7(1): 117-119. *https://doi.org/10.22271/oral.2021.v7.i1b.1127*
12. Yousef RAS, Wasfi AAM. Temporomandibular disorder features in complete denture patients versus patients with natural teeth; a comparative study. Pakistan Oral Dental J 2010; 30 (1): 254-259.

13. Choy E, Smith DE. The prevalence of temporomandibular joint disturbances in complete denture patients. J Oral Rehab 1980; 7: 331-352. *http://dx.doi.org/10.1111/j.1365-2842.1980.tb00452.x*
14. Agerberg G, Bergenholtz A. Craniomandibular disorders in adult populations of West Bothnia, Sweden. Acta Odontologica Scandinavica 1989; 47: 129-140. *https://doi.org/10.3109/00016358909007693*
15. Dzalaeva F, Chikunov S, Bykova M, Deev M, Okromelidze M. Study of the clinical efficiency of an interdisciplinary approach to the treatment of orofacial pain and temporomandibular joint disorders in patients with complete or partial edentulism. Eur J Dent 2020 Oct;14(4):657-664. *http://dx.doi.org/10.1055/s-0040-1714764*
16. Dervis, E. Changes in temporomandibular disorders after treatment with new complete dentures. J Oral Rehab 2004; 31, 320-326. *https://doi.org/10.1046/j.1365-2842.2003.01245.x*
17. Wang M, Xue F, He J, *et al*. Missing posterior teeth and risk of temporomandibular disorders. J Dental Res 2009; 88, 942-945. *http://dx.doi.org/10.1177/0022034509344387*
18. Schiffman EL, Truelove EL, Ohrbach R, *et al*. The research diagnostic criteria for temporomandibular disorders. I: overview and methodology for assessment of validity. J Orofac Pain 2010 Winter;24(1):7-24.
19. Shi Q, Wang YY. Investigation of the prevalence of temporomandibular disorders in 352 aged edentulous individuals. Zhonghua Kou Qiang Yi Xue Za Zhi 2012 Jan;47(1):19-21. *http://dx.doi.org/10.3760/cma.j.issn.1002-0098.2012.01.007*
20. Divaris K, Ntounis A, Marinis A, Polyzois G, Polychronopoulou A. Loss of natural dentition: Multi-level effects among a geriatric population. Gerodontol 2012 Jun;29(2):e192-9. *http://dx.doi.org/10.1111/j.1741-2358.2010.00440.x*
21. Carlsson GE. Epidemiology and treatment need for temporomandibular disorders. J Orofac Pain 1999 Fall; 13(4):232-7. PMID: 10823035.
22. Shet RG, Rao S, Patel R, *et al*. Prevalence of temporomandibular joint dysfunction and its signs among the partially edentulous patients in a village of North Gujarat. J Contemp Dent Pract 2013 Nov 1;14(6):1151-5. *http://dx.doi.org/10.5005/jp-journals-10024-1466*
23. Kirov DN, Krastev DS. Prevalence of signs and symptoms of temporomandibular disorders in patients wearing complete dentures. Int J Sci Res 2014; 3: 947-9.
24. Elfving I, Helkimo M, Magnusson T. Prevalence of different temporomandibular joint sounds, with emphasis on disc-displacement, in patients with temporomandibular disorders and controls. Swedish Dental J 2002; 26: 9-19. PMID: 12090160
25. Dallanora AF, Grasel CE, *et al*. Prevalence of temporo-mandibular disorders in a population of complete denture wearers. Gerodontol 2012; 29: e865-e869. *http://dx.doi.org/10.1111/j.1741-2358.2011.00574.x*
26. Fillingim RB, Ohrbach R, Greenspan JD, *et al*. Psychological factors associated with development of TMD: the OPPERA prospective cohort study. J Pain 2013 Dec; 14(12 Suppl):T75-90. *http://dx.doi.org/10.1016/j.jpain.2013.06.009*
27. Kareem JJ, Abdulraheem SM, Rafeeq AK, Hamid MA. Clinical study to evaluate the prevalence of TMD before and after delivery of complete denture. Tikrit J Dental Sci 2017; 5(2): 98-108. 89
28. Al-Shami IZ, Alrubaidi YAS, AL-Haddad KA, *et al*. Effect of removable dentures on colonization of aerobic bacteria in the oral cavity and antibiotic pattern of the common isolated bacteria. Universal J Pharm Res 2022; 7(6):1-8. *https://doi.org/10.22270/ujpr.v7i6.862*
29. Al-Kebsi AM, Othman AM, Al-Shamahy HA, *et al*. Oral C. albicans colonization and non-candida albicans candida colonization among University students, Yemen. Universal J Pharm Res 2017; 2(5): 5-9. *https://orcid.org/10.22270/ujpr.v2i5.R2*
30. Alhasani AH, Al-Akwa AAY, Al-Shamahy HA, *et al*. Biofilm formation and antifungal susceptibility of Candida isolates from oral cavity after the introduction of fixed orthodontic appliances. Universal J Pharm Res 2020; 5(4):1-8. *https://orcid.org/10.22270/ujpr.v5i4.435*
31. Al-Sanabani NF, Al-Kebsi AM, Al-Shamahy HA, Abbas MA. Etiology and risk factors of stomatitis among Yemeni denture wearers. Universal J Pharm Res 2018; 3(1):1-5. *https://orcid.org/10.22270/ujpr.v3i1.R9*
32. Al-Haddad KA, Al-dossary OAE, Al-Shamahy HA. Prevalence and associated factors of oral non-candida albicans candida carriage in denture wearers in Sana'a city-Yemen. Universal J Pharm Res 2018; 3(4):1-6. *https://orcid.org/10.22270/ujpr.v3i4.176*
33. Al-Shami HZ, Al-Haimi MA, Al-Shamahy HA, *et al*. Patterns of antimicrobial resistance among major bacterial pathogens isolated from clinical samples in two tertiary's hospitals, in Sana'a, Yemen. Universal J Pharm Res 2021; 6(5):60-67. *https://doi.org/10.22270/ujpr.v6i5.674*
34. Makki KIF, Abbas AMA, Alhadi YAA, Al-Shamahy HA. Clinical effects of Platelets Rich Fibrin (PRF) following surgical extraction of impacted lower third molars among a sample of Yemeni adults. Universal J Pharm Res 2022; 7(6):14-21. *https://doi.org/10.22270/ujpr.v7i6.864*
35. Al Makdad ASM, Al-Haifi AY, Salah MK, Al-ShamahyHA, Al-Falahi TH. Urinary tract infections in post operative patients: prevalence rate, bacterial profile, antibiotic sensitivity and specific risk factors. Universal J Pharm Res 2020; 5(3):21-26. *https://doi.org/10.22270/ujpr.v5i3.329*
36. Abbas AM, Al-Kibsi TAM, Al-Shamahy HA, *et al*. Characterization and antibiotic sensitivity of bacteria in orofacial abscesses of odontogenic origin. Universal J Pharm Res 2020; 5(6):36-42. *https://doi.org/10.22270/ujpr.v5i6.510*
37. Al-Akwa AA, Zabara A, Al-Shamahy HA. Prevalence of Staphylococcus aureus in dental infections and the occurrence of MRSA in isolates. Universal J Pharm Res 2020; 5(2):1-6. *https://doi.org/10.22270/ujpr.v5i2.384*
38. Al-Shamahy HA, Abbas AMA, Mahdie Mohammed AM, Alsameai AM. Bacterial and fungal oral infections among patients attending dental clinics in Sana'a City-Yemen. On J Dent Oral Health 2018; 1(1): 1-6. *https://doi.org/10.33552/OJDOH.2018.01.000504*
39. Gylan EMA, Muharram BA, Al-Shamahy HA, *et al*. *In vitro* evaluation of the antimicrobial activity of five herbal extracts against *Streptococcus mutans*. Universal J Pharm Res 2022; 7(1):1-6. *https://doi.org/10.22270/ujpr.v7i1.721*
40. Al-dossary OAI, Al-Kholani AIM, Al-Shamahy HA, *et al*. Interleukin-1β levels in the human gingival sulcus: Rates and factors affecting its levels in healthy subjects. Universal J Pharm Res 2022; 7(5): 25-30. *https://doi.org/10.22270/ujpr.v7i5.838*
41. Alhadi YAA, Al-Shamahi NYA, Al-Shamahy HA, *et al*. Maxillary sinus septa: Prevalence and association with gender and location in the maxilla among adults in Sana'a city, Yemen. Universal J Pharm Res 2022; 7(3):20-26. *https://doi.org/10.22270/ujpr.v7i3.775*
42. Alhadi Y, Rassem AH, Al-Shamahy HA, Al-Ghaffari KM. Causes for extraction of permanent teeth in general dental practices in Yemen. Universal J Pharm Res 2019; 4(2): 1-6. *https://doi.org/10.22270/ujpr.v4i2.249*
43. Dahaq WAM, Al-Kholani AIM, Al-Shamahy HA, *et al*. Tanaka and Johnston's mixed dentition validity: an analysis among Yemeni adults in Sana'a city. Universal J Pharm Res 2021; 6(6):1-5. *https://doi.org/10.22270/ujpr.v6i6.691*
44. Yehia LAB, AL-Haddad KA, Al-labani MA, *et al*. Occlusal characteristics of the primary dentition among a sample of Yemeni pre-school children. Universal J Pharm Res 2020; 5(1):1-6. *https://doi.org/10.22270/ujpr.v5i1.359*
45. Mutaher NJA, AL-Haddad KA, Al-Shamahy HA, *et al*. Prevalence and causes of traumatic dental injuries to anterior teeth among primary school children in Sana'a city, Yemen. Universal J Pharm Res 2020; 5(3):38-43. *https://doi.org/10.22270/ujpr.v5i3.329*