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THE PREVALENCE OF TEMPOROMANDIBULAR DISORDERS AMONG ORTHODONTIC PATIENTS IN KSA

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Abstract

Background: This article discusses the prevalence of temporomandibular disorder among orthodontic patients in Saudi Arabia. It covers topics like the relationship between TMD and orthodontic treatment and the symptoms and severity of TMD.TMD is a wide variety of conditions affecting the temporomandibular joints and facial muscles and their associated structure.

Objective: The main objective of this study was to determine the prevalence of temporomandibular disorder among orthodontic patients in Saudi Arabia.

Methods: This study is a cross-sectional questionnaire survey in Saudi Arabia. The cross-sectional questionnaire was carried out between July to November 2024. The study recruits' participants through social media platforms like Twitter, Snapchat, Instagram, WhatsApp, and Facebook. The inclusion criteria for this study were as follows: any patient who had or has orthodontic treatment in both genders at any age of Saudi populations, and any patient who has not done orthodontic treatment were excluded from this study. The minimum target sample size of 384 was calculated using a formula based on prevalence estimation, 95% confidence level, and 5% acceptable error.

Results: Regarding the prevalence of temporomandibular disorders among orthodontic patients, our findings indicated that 80% of participants had undergone orthodontic treatment, primarily using traditional metal braces (72%). Notably, 40.6% reported experiencing pain prior to treatment. While the majority did not report significant difficulties with mouth movement, 31% experienced muscular fatigue and pain while chewing, and 31.1% reported occasional headaches, highlighting common discomforts linked to TMD. Furthermore, 57.1% described themselves as "nervous," suggesting possible psychological influences on TMD symptoms.

Conclusion: The study highlighted the high prevalence of TMD among orthodontic patients in Saudi Arabia, finding that most of participants had been treated for orthodontics based mainly on obsolete metal braces. Although there is unanimity among most orthodontists that TMD cannot be made worse by orthodontic intervention, a large portion of participants experienced discomfort related to TMD, including muscular fatigue and headaches.

Keywords: prevalence, temporomandibular disorder, orthodontic patient, Saudi Arabia.

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Introduction:

Temporomandibular disorders (TMDs) are a heterogeneous group of disorders involving temporomandibular joints (TMJs), masticatory muscles, and their associated structures [1,2]. The most typical indications and symptoms include restricted or asymmetric mandibular motions, TMJ noises, and pain in the masticatory and TMJ regions [3,4].

Adolescents worldwide experience an increase in TMD prevalence, which in Saudi Arabia can range from 7% to 30% [5]. The most prevalent chronic orofacial pain disorder, estimations of prevalence range from 10% to 25% of the population [6]. TMD is a prevalent condition that affects 26–46% of young people [7]. It should be noted the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) are being used in studies on a variety of populations. The prevalence of TMD in younger age groups and females was a consistent finding in the investigations in 2018 [8]. An estimated 37% of university students in Saudi Arabia, who are between the ages of 20 and 25, have TMD [9]. A study on the frequency of TMD following orthodontic treatment in 50 patients was carried out in 2020; following clinical evaluation, joint pathology occurred in 22 patients (44%), and the chi-square test showed $p=0.4$ ($p<0.05$) [10].

Notably, compared to the Class I group, the experimental group with distal and mesial occlusion exhibited a larger proportion of TMD. Both the experimental and control groups' participants were mostly suffering from mild TMD. Compared to males, girls in the experimental group exhibited a greater prevalence of TMD. According to a 2022 research that used the Fonseca Anamnestic Index, 56.41% of students and 45.03% of orthodontic patients in the experimental group had some kind of TMD [11]. The distinctive pain intensity, mastication, mobility, communication, global, and PHQ-9 ratings of the experimental group were considerably higher ($p<.05$) than those of the control group, according to a cross-sectional study published in 2024. Patients wearing Class III elastics had statistically significantly higher scores for both the interference score and the chronic pain grade compared to patients wearing Class II elastics ($p<.05$). Patients' PHQ-9 ratings were statistically substantially higher ($p<.05$) for those who used elastics for less than six months than for those who used them for more than six months. [12].

A clinical study in 2022 using DC/TMD found a significant difference in masticatory, vertical mobility, and verbal-emotional expression limitations between two orthodontic groups of different treatment durations (3-5 months/10-14 months). The study revealed an increase in limitations with longer orthodontic therapy. However, there was no significant difference in somatization, psychosocial status, chronic pain, and oral habits between the groups. The study concluded that TMD symptoms were not significantly associated with orthodontic treatment [13]. The goal of this study is to establish the prevalence of temporomandibular disorders among orthodontic patients.

This research focused on evaluating the prevalence of TMDs among Saudi populations who have done orthodontic treatment due to the insignificant number of research related to our topic, especially in Saudi Arabia.

Methodology:

Study Design and Setting:

This study is a cross-questionnaire survey in Saudi Arabia, located in the furthermost part of southwest Asia. Indeed, we conducted the cross-sectional survey between July - November 2024. Participants, recruitment and sampling procedure: To acquire individuals from around Saudi Arabia, a sample recruiting approach was relied on social media platforms (such as Twitter, Snapchat, Instagram, WhatsApp, Facebook, etc.). Participants were recruited between July 2024 to December 2024.

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Sample size:
Rao et al., USA (22) computed the minimum sample size of 384 persons using the following formula with means and standard deviation.
Considering standard deviation (=1.96) for a 95% Confidence interval and the
maximum acceptable, marginal error (=0.05). Therefore, the calculated minimum sample size required for this study is:
n= (1.96) ^2X 0.50X 0.50/ (0.50) ^2= 384 participants using the Qualtrics calculator and a 95% degree of confidence.
The sample size was estimated, So the minimum sample size was 384.

Inclusion and Exclusion Criteria:
The inclusion criteria for this study were as follows: any patient who had or has orthodontic treatment in both genders and at any age of Saudi populations, and any patient who has not done orthodontic treatment were excluded from this study.

Method for data collection, instrument and score system:
A structured questionnaire was utilized as the study tool. This tool was developed after analyzing relevant research conducted in Saudi Arabia and worldwide. The full questionnaire consisted of twenty-three questions. The questionnaire asked for demographic information such as age, gender, residential area, educational qualification, material state, occupation, and income. Following being questioned if they had gotten orthodontic treatment, the participants asked about how long they had worn it. They also asked if there was any local or referred pain, in addition to problems while moving the jaw. Finally, they were asked if they had any bad habits.

Pilot test:
Twenty people were given the questionnaire and asked to fill it out. This was done to assess the study's viability and the ease of use of the questionnaire. The pilot study's results were not included in the study's final analysis.

Analyzes and entry method:
The personal computer was used to enter data using the "Microsoft Office Excel Software" (2016) Windows software. After that, data was moved to be statistically analyzed using the Statistical Package of Social Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.).

Results:

In Table (1), we present some of the demographic parameters of the participants who totaled (704). Participants are shown to be on average 28.2 years old with a standard deviation of 10.3, which demonstrates a clear predominance of those that are very much younger at 73.9% of the sample in the sample being less than 30 years old. Overall, gender representation in the broad random sample is skewed considerably towards female at 79% suggesting possible implications for gender specific interventions or possibilities in future research. Respondents are most from the southern region (74.1%) thus meaning that somehow, some region seems to control the findings. Additionally, educationally, a large proportion of singles (65.8%) and a notable 64.2 per cent with a bachelor's degree may be linked to wider socio-economic trends. Employment data shows a significant number of students (44%) who

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are heavily involved in the youth demographic of academia, while on income distribution a large proportion of students are earning less than $1,000 a month (44.5%), thereby putting conversations around financial support and economic policy within this framework.

Table (1): Sociodemographic characteristics of participants (n=704)

Parameter		***No.***	***Percent (%)***
Age (Mean: 28.2, STD: 10.3)	less than 21 years	146	20.7
	21 to 22	99	14.1
	23 to 24	134	19.0
	25 to 30	130	18.5
	31 to 40	91	12.9
	more than 40	104	14.8
Gender	Female	556	79.0
	Male	148	21.0
Residential region	Northern region	8	1.1
	Southern region	522	74.1
	Central region	82	11.6
	Eastern region	45	6.4
	Western region	47	6.7
Educational level	Middle school	10	1.4
	High school	122	17.3
	Diploma	81	11.5
	University Student	5	.7
	Bachelor's degree	452	64.2
	Postgraduate degree	30	4.3
	Uneducated	4	.6
Marital status	Single	463	65.8
	Married	229	32.5
	Divorced	11	1.6
	Widowed	1	.1
Occupation	Student	310	44.0
	Employee	228	32.4
	Freelancer	20	2.8
	Unemployed	131	18.6
	Retired	15	2.1
Monthly income	Less than 1000	313	44.5
	1000 to 5000	172	24.4
	5001 to 10000	88	12.5
	10001 to 15000	62	8.8
	More than 15000	69	9.8

As seen in Figure 1, the trends within the patient population that the data in the The duration of orthodontic treatment presents are significant. It is also worth noting that a large share of the patients, 39.5 percent, had treatment that lasted one to two years, 308 of the total 1,000 patients, as this. However, only 18.9 % of patients completed treatment in a year or less, or 189 individuals. Of 149 cases it was

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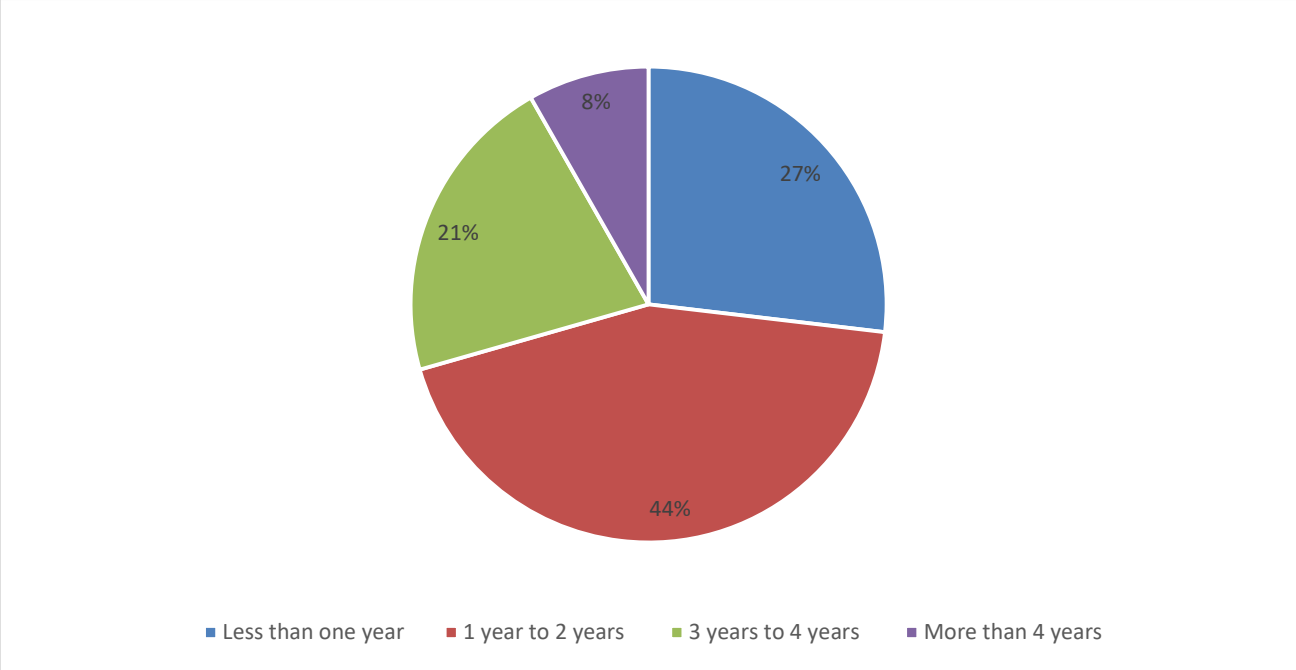
14.9 per cent or the percentage of patients whose treatment of three to four years. Additionally, 58 patients or 5.8% needed more than four years of orthodontic intervention.

Figure (1): Illustrates the length of orthodontic treatment among participants.



The data presented, as illustrated in table (2), provides compelling insights into how the orthodontic treatment experiences of 704 participated. Eighty percent reported having received orthodontic treatment and metal braces was the most common modality reported, at 72 percent. Perhaps this preference for traditional metal braces over clear aligners (28%) reflects still some trust in their efficacy. Interestingly, enough 40.6% of the respondents claimed to have experienced pain prior to treatment which is an important consideration to make a decision to visit any orthodontist. Treatment duration was variable, the most of which (43.8%) having received treatment time ranging from one to two years, similar to the common orthodontic protocols. Given the nature of orthopedic correction (e.g. limited mouth opening or side to side mandibular movement as reported by 4.5% and 4.0% of respondents to be difficult always), a surprisingly large number of respondents (39.1% and 46.7%) never had problems with these issues.

Table (2): Parameters related to orthodontic treatment of participants (n=704).

Parameter		***No.***	***Percent (%)***
Did you have an orthodontic treatment:	No	141	20.0
	Yes	563	80.0
What kind of orthodontic treatment did you have?	Metal braces	507	72.0
	Clear aligners	197	28.0
Did you experience pain before orthodontic treatment?	No	418	59.4
	Yes	286	40.6
	Less than one year	189	26.8

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How long did the orthodontic treatment last?	1 year to 2 years	308	43.8
	3 years to 4 years	149	21.2
	More than 4 years	58	8.2
Is it difficult for you to open your mouth?	Always	32	4.5
	Usually	85	12.1
	Sometimes	196	27.8
	Rarely	116	16.5
	Never	275	39.1
Is it hard for you to move your mandible from side to side?	Always	28	4.0
	Usually	70	9.9
	Sometimes	172	24.4
	Rarely	105	14.9
	Never	329	46.7

Fig. (2) shows the results of data presented on the temporomandibular joint (TMJ) clicking while chewing or opening the mouth in the respondents about its prevalence. Interestingly too, 33 people (4.1%) said that they experience TMJ clicking 'always', and 90 people (11.3%) said hearing TMJ click 'usually'. The largest segment is the category of 'sometimes,' with 199 people, 25.1%. On the other hand, 114 folks (14.3%) get to clicking “rarely.” Of most note, 218, or roughly 27.4 percent, of participants said they 'never' click on tab. Together this data indicates that a significant portion of the population will have TMJ clicking at least at times with just over 61.5% of respondents reporting this experience.

Figure (2): Illustrates experiencing TMJ clicking during chewing among participants.

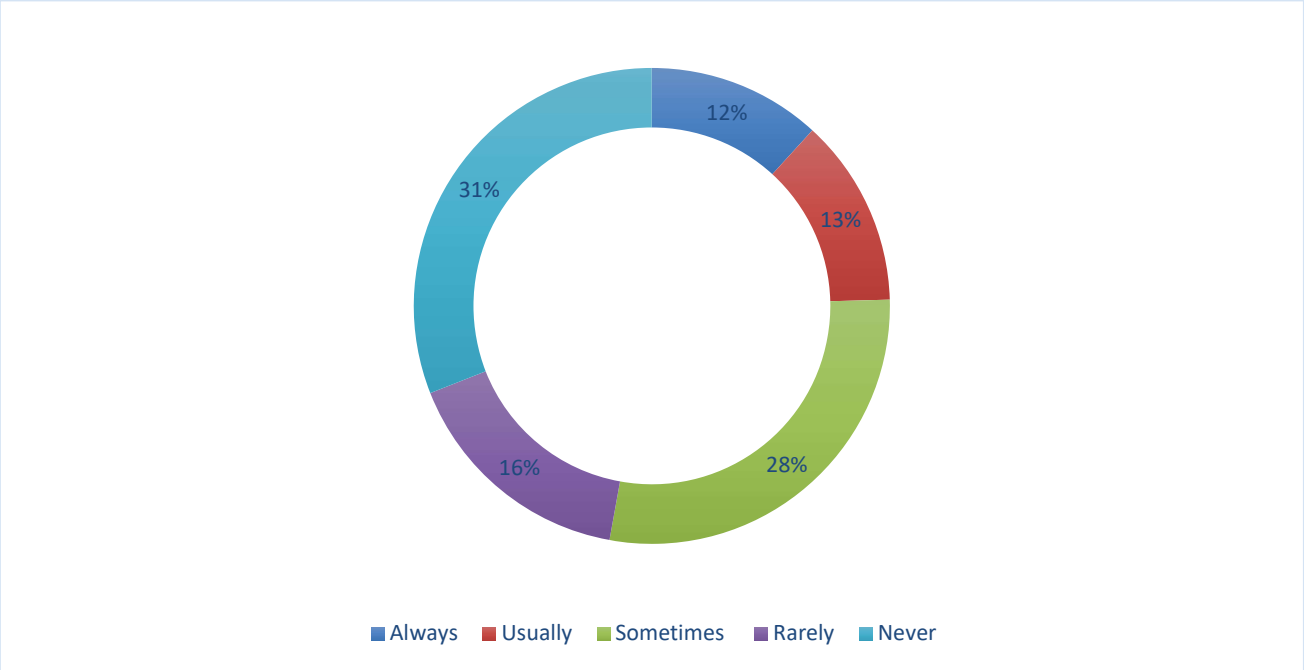

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Table (3) provides a broad picture of an elucidated cohort group of participants with temporomandibular joint (TMJ) pain. Interestingly, muscular fatigue and pain with chewing is noted as being present in 31% of the respondents, potentially a major source of distress for many within this population. As headaches are also found prevalent with more than 31.1 percent of respondents reporting that they have them often, they are also on this list. Likewise, 33.4% say they've never had neck stiffness or pain, which suggests that some participants may not attribute their symptoms to TMJ dysfunction. The findings also highlight a noteworthy aspect: 57.1% of people are defined as 'nervous' and may contribute to the correlation between mental and TMJ pain. Reported, too, were oral habits such as teeth clenching or grinding, initiated by 41.1%.

Table (3): participants' knowledge and awareness of TMJ pain (n=704).

Parameters		***No.***	***Percent (%)***
Do you get tired or have muscular pain while chawing?	Always	54	7.7
	Usually	92	13.1
	Sometimes	218	31.0
	Rarely	122	17.3
	Never	218	31.0
Do you have frequent headaches?	Always	63	8.9
	Usually	124	17.6
	Sometimes	219	31.1
	Rarely	129	18.3
	Never	169	24.0
Do you have pain on the nape or stiff neck?	Always	58	8.2
	Usually	100	14.2
	Sometimes	185	26.3
	Rarely	126	17.9
	Never	235	33.4
Do you have earaches or pain in your temporomandibular joint?	Always	48	6.8
	Usually	83	11.8
	Sometimes	199	28.3
	Rarely	122	17.3
	Never	252	35.8
Can you describe the pain?	Severe	34	4.8
	Average	277	39.3
	Little	177	25.1
	No pain	216	30.7
Have you noticed any TMJ clicking while chewing or opening your mouth?	Always	83	11.8
	Usually	90	12.8
	Sometimes	199	28.3
	Rarely	114	16.2
	Never	218	31.0
Do you clench your teeth?	Always	97	13.8
	Usually	120	17.0
	Sometimes	208	29.5

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	Rarely	116	16.5
	Never	163	23.2
Do you gride your teeth?	Always	63	8.9
	Usually	81	11.5
	Sometimes	156	22.2
	Rarely	115	16.3
	Never	289	41.1
Do you feel your teeth do not articular well?	Always	119	16.9
	Usually	97	13.8
	Sometimes	190	27.0
	Rarely	76	10.8
	Never	222	31.5
Do you consider yourself a tens (nervous) person?	No	302	42.9
	Yes	402	57.1
Do you have any oral habits?	Always	117	16.6
	Usually	96	13.6
	Sometimes	155	22.0
	Rarely	108	15.3
	Never	228	32.4
Do you have mobility in your teeth?	No	468	66.5
	Yes	236	33.5

Table (4) shows that experiencing pain before orthodontic treatment has statistically significant relation to age (P value=0.031). It also shows statistically insignificant relation to gender, residential region, educational level, marital status, occupation and monthly income.

Table (4): Relation between experiencing pain before orthodontic treatment and sociodemographic characteristics.

Parameters		***Did you experience pain before orthodontic treatment?***		***Total (N=704)***	***P value ****
		No	**Yes**		
Gender	Female	328	228	556	0.689
		78.5%	79.7%	79.0%	
	Male	90	58	148	
		21.5%	20.3%	21.0%	
Age	less than 21 years	98	48	146	0.031
		23.4%	16.8%	20.7%	
	21 to 22	59	40	99	
		14.1%	14.0%	14.1%	
	23 to 24	84	50	134	
		20.1%	17.5%	19.0%	
	25 to 30	64	66	130	
		15.3%	23.1%	18.5%	

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	31 to 40	58	33	91	
		13.9%	11.5%	12.9%	
	more than 40	55	49	104	
		13.2%	17.1%	14.8%	
Residential region	Northern region	2	6	8	0.061
		0.5%	2.1%	1.1%	
	Southern region	312	210	522	
		74.6%	73.4%	74.1%	
	Central region	51	31	82	
		12.2%	10.8%	11.6%	
	Eastern region	31	14	45	
		7.4%	4.9%	6.4%	
	Western region	22	25	47	
		5.3%	8.7%	6.7%	
Educational level	University student	4	1	5	0.722
		1.0%	0.3%	0.7%	
	Middle school	7	3	10	
		1.7%	1.0%	1.4%	
	High school	73	49	122	
		17.5%	17.1%	17.3%	
	Diploma	49	32	81	
		11.7%	11.2%	11.5%	
	Bachelor's degree	265	187	452	
		63.4%	65.4%	64.2%	
	Postgraduate	19	11	30	
		4.5%	3.8%	4.3%	
	Uneducated	1	3	4	
		0.2%	1.0%	0.6%	
Marital status	Single	280	183	463	0.182
		67.0%	64.0%	65.8%	
	Married	129	100	229	
		30.9%	35.0%	32.5%	
	Divorced	9	2	11	
		2.2%	0.7%	1.6%	
	Widowed	0	1	1	
		0.0%	0.3%	0.1%	
Occupation	Student	196	114	310	0.206
		46.9%	39.9%	44.0%	
	Employee	132	96	228	
		31.6%	33.6%	32.4%	
	Freelancer	8	12	20	
		1.9%	4.2%	2.8%	
	Unemployed	74	57	131	
		17.7%	19.9%	18.6%	

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	Retired	8	7	15	
		1.9%	2.4%	2.1%	
Monthly income	Less than 1000	189	124	313	0.362
		45.2%	43.4%	44.5%	
	1000 to 5000	103	69	172	
		24.6%	24.1%	24.4%	
	5001 to 10000	44	44	88	
		10.5%	15.4%	12.5%	
	10000 to 15000	37	25	62	
		8.9%	8.7%	8.8%	
	More than 15000	45	24	69	
		10.8%	8.4%	9.8%	

P value was considered significant if ≤ 0.05.

Table (5) shows that experiencing pain in TMJ has statistically significant relation to gender (P value=0.004), age (P value=0.010). It also shows statistically insignificant relation to residential region, educational level, marital status, occupation and monthly income.

Table (5): Experiencing pain in TMJ in association with sociodemographic characteristics.

Parameters		***Do you have earaches or pain in your temporomandibular joint?***		***Total (N=704)***	***P value ****
		Frequent	**Infrequent or never**		
Gender	Female	276	280	556	0.004
		83.6%	74.9%	79.0%	
	Male	54	94	148	
		16.4%	25.1%	21.0%	
Age	less than 21 years	77	69	146	0.010
		23.3%	18.4%	20.7%	
	21 to 22	45	54	99	
		13.6%	14.4%	14.1%	
	23 to 24	44	90	134	
		13.3%	24.1%	19.0%	
	25 to 30	69	61	130	
		20.9%	16.3%	18.5%	
	31 to 40	45	46	91	
		13.6%	12.3%	12.9%	
	more than 40	50	54	104	
		15.2%	14.4%	14.8%	
Residential region	Northern region	6	2	8	0.114
		1.8%	0.5%	1.1%	
	Southern region	240	282	522	
		72.7%	75.4%	74.1%	
	Central region	41	41	82	

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		12.4%	11.0%	11.6%	
	Eastern region	16	29	45	
		4.8%	7.8%	6.4%	
	Western region	27	20	47	
		8.2%	5.3%	6.7%	
Educational level	University student	2	3	5	0.262
		0.6%	0.8%	0.7%	
	Middle school	6	4	10	
		1.8%	1.1%	1.4%	
	High school	55	67	122	
		16.7%	17.9%	17.3%	
	Diploma	40	41	81	
		12.1%	11.0%	11.5%	
	Bachelor's degree	204	248	452	
		61.8%	66.3%	64.2%	
	Postgraduate	20	10	30	
		6.1%	2.7%	4.3%	
	Uneducated	3	1	4	
		0.9%	0.3%	0.6%	
Marital status	Single	209	254	463	0.312
		63.3%	67.9%	65.8%	
	Married	117	112	229	
		35.5%	29.9%	32.5%	
	Divorced	4	7	11	
		1.2%	1.9%	1.6%	
	Widowed	0	1	1	
		0.0%	0.3%	0.1%	
Occupation	Student	139	171	310	0.106
		42.1%	45.7%	44.0%	
	Employee	103	125	228	
		31.2%	33.4%	32.4%	
	Freelancer	14	6	20	
		4.2%	1.6%	2.8%	
	Unemployed	64	67	131	
		19.4%	17.9%	18.6%	
	Retired	10	5	15	
		3.0%	1.3%	2.1%	
Monthly income	Less than 1000	152	161	313	0.640
		46.1%	43.0%	44.5%	
	1000 to 5000	78	94	172	
		23.6%	25.1%	24.4%	
	5001 to 10000	44	44	88	
		13.3%	11.8%	12.5%	
	10000 to 15000	29	33	62	

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		8.8%	8.8%	8.8%	
	More than 15000	27	42	69	
		8.2%	11.2%	9.8%	

P value was considered significant if ≤ 0.05.

Discussion:

Temporomandibular disorder (TMD) is usually defined as a collective term that embraces a number of clinical problems that involve the masticatory muscles, the temporomandibular joint (TMJ) and the associated structures and forms the most prevalent clinical entity afflicting the masticatory apparatus. In this respect, it is considered a musculo-skeletal disorder [14]. However, TMD is also the main cause of pain of non-dental origin in the oro-facial region including head, face and related structures. The causes and underlying mechanisms of TMD are not well understood. It is widely acknowledged that TMD has a multifactorial etiology, consisting of numerous direct and indirect contributing factors [15]. Among these, occlusion is often highlighted as a key cause of TMD. The reported prevalence of TMD varies between 20% and 50%, which may be influenced by factors such as population race, sampling methods, and definitions used [16]. Many theories regarding the causes and treatment of TMD are based on this assumed connection and have supported various therapeutic methods, including occlusal appliance treatment, anterior repositioning devices, occlusal adjustments, restorative treatments, and orthodontic and orthognathic procedures. On the other hand, some types of dental treatments, particularly standard orthodontic care, have also been identified as potential contributors to TMD [17]. Thus we aimed in this study to determine the prevalence of temporomandibular disorder among orthodontic patients in Saudi Arabia.

We found interesting parallels and differences comparing our study findings for prevalence temporomandibular disorders with previous research. We found that a staggering 80% of participants had been previously treated with orthodontic appliances specifically, and that these were usually traditional, tooth bound metal braces. This is consistent with Henrikson and Nilner [18] who found, in female subjects, fluctuating TMD symptoms among treated and untreated subjects. For those participants with orthodontic treatment, they reported a reduction in TMD symptoms over a two year treatment period, and claimed that orthodontic intervention might not exacerbate TMD signs and could even confer functional benefits in patients with certain malocclusions. For example, Rey et al. [19] also reported significant TMD prevalence between Class III patients treated with mandibular cervical headgear and untreated controls, suggesting that the changes evoked by treatment are due to remodeling and not associated with an increase in TMD risk. Additionally, a meta-analysis on orthodontics and TMD supports our results, as it found that traditional orthodontic methodologies do not increase the risk of TMD. This narrative is also supported by the systematic review of Mohlin [20] that further suggests that the occurrence of TMD cannot be related to any particular type of malocclusion, and therefore that orthodontic treatment does not give rise to TMD. These insights were also supported by a longitudinal cohort study [21], which demonstrated that orthodontic treatments neither condition nor prevent TMD, with prior orthodontics not associated with any increased TMD risk for new or recurrent TMD.

Another finding in Dibbets and van der Weele [22] noted that although indicators for TMD ascend with age, long term follow up shows no causal relationship between specific orthodontic treatments, such as extractions, and the development of TMD symptoms over 20 years. This contrasts with our own observation that participants reported considerable discomforts associated with TMD: muscular fatigue (31%) and headache (31.1%) and although orthodontic treatment is typically thought to not aggravate

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TMD, subjective symptoms may remain in some patient populations. No correlation was found between new or persistent TMD occurrence and orthodontic treatment in Tatiana V. Macfarlane et al. [23] , who showed that TMD prevalence varied throughout their study. Interestingly, though we found a relatively high prevalence of anxiety (57.1 %) among participants, which may impact symptom perception, Macfarlane's findings indicate a correlation between psychological variables and TMD onset among females with higher rates of TMD. Thus, the pathological entity of TMD would be something that is multifactorial with psychological, biological and behavioral aspects. Additionally, our evaluation revealed a vast amount of the involved participants (41.1%) practicing oral habits against TMD such as teeth clenching and grinding, given the fact that other publications had highlighted oral habits as one of the triggers to aggravate TMD [24]. One study found that initiation of orthodontic treatment might transiently increase muscular soreness which reversed over time [25]. The time period during which this temporary discomfort would parallel the issues participants in our study would experience with their pain and muscular fatigue during treatment. Furthermore, even though research on clear aligners has proven minor transient soreness without overt TMD symptoms, our findings require a more nuanced understanding of the way more than one orthodontic modality could affect TMD symptoms [26].

Conclusion:

The study highlighted the high prevalence of TMD among orthodontic patients in Saudi Arabia, finding that most of participants had been treated for orthodontics based mainly on obsolete metal braces. Although there is unanimity among most orthodontists that TMD cannot be made worse by orthodontic intervention, a large portion of participants experienced discomfort related to TMD, including muscular fatigue and headaches.

These findings highlight the complexity of TMD's multifactorial nature, influenced by psychological factors and oral habits such as teeth clenching and grinding. Although the results align with existing literature suggesting that orthodontic treatment typically does not increase TMD risk, it also suggests that heightened awareness and monitoring for TMJ-related symptoms are essential in orthodontic care. Further longitudinal studies are warranted to explore the long-term implications of orthodontic treatment on TMD among diverse populations.

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Ethical approval

An informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only.

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Conflict of interests

The authors declare no conflict of interest.

Informed consent:

Written informed consent was acquired from each individual study participant.

Data and materials availability

All data associated with this study are present in the paper.

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