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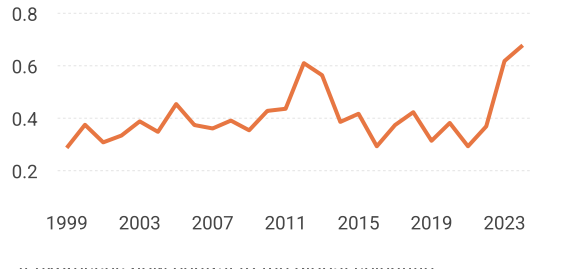

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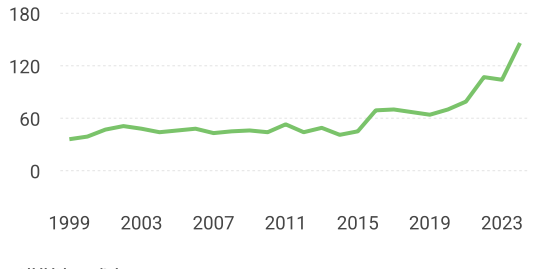

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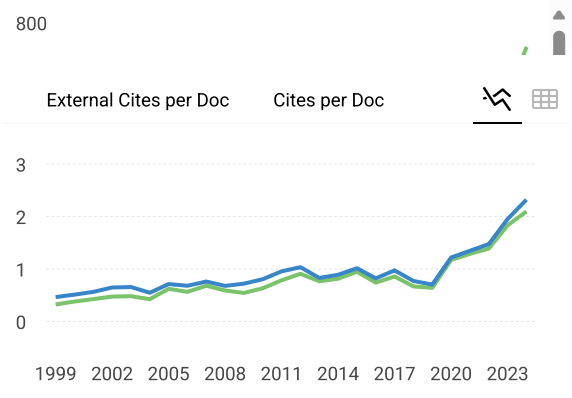

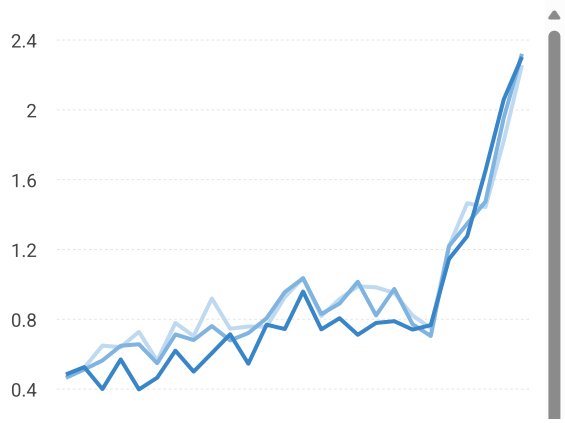

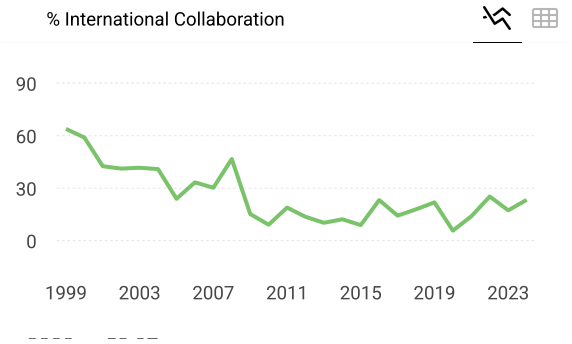

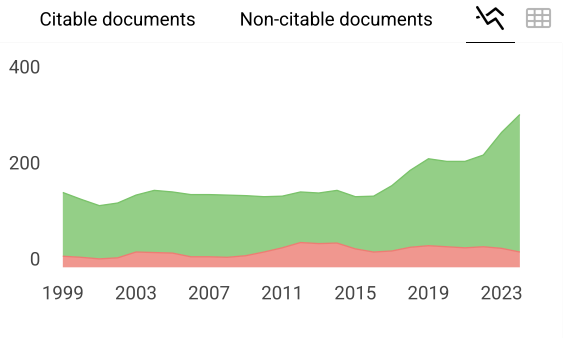

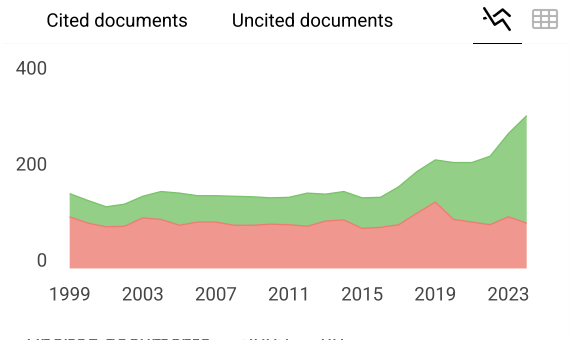

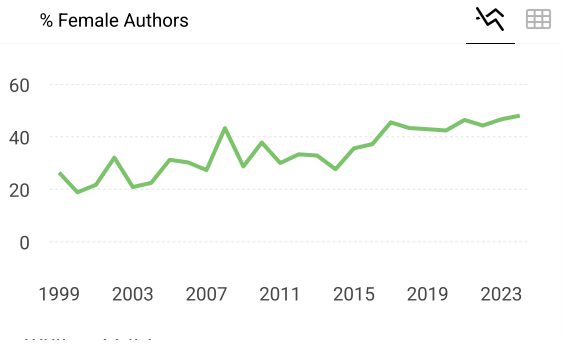

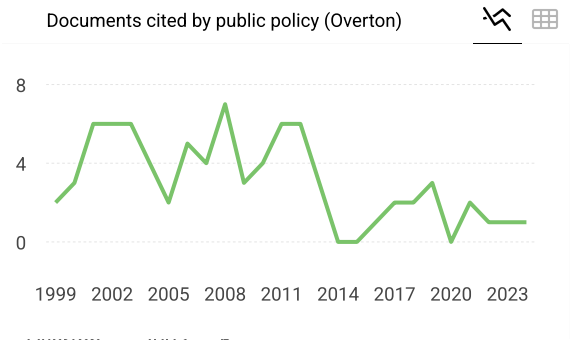

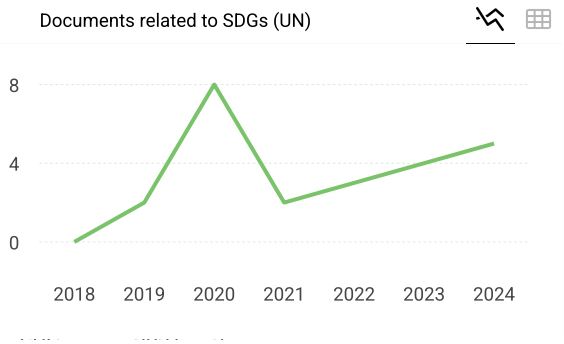

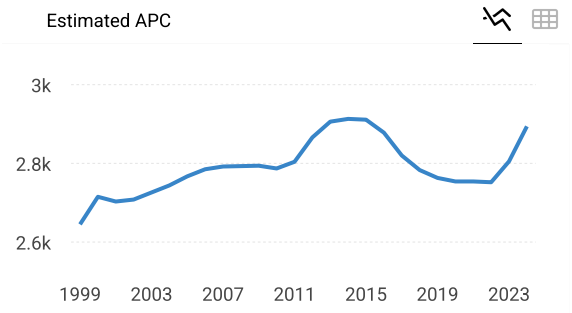

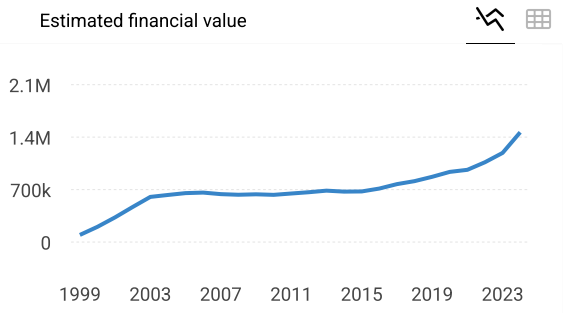

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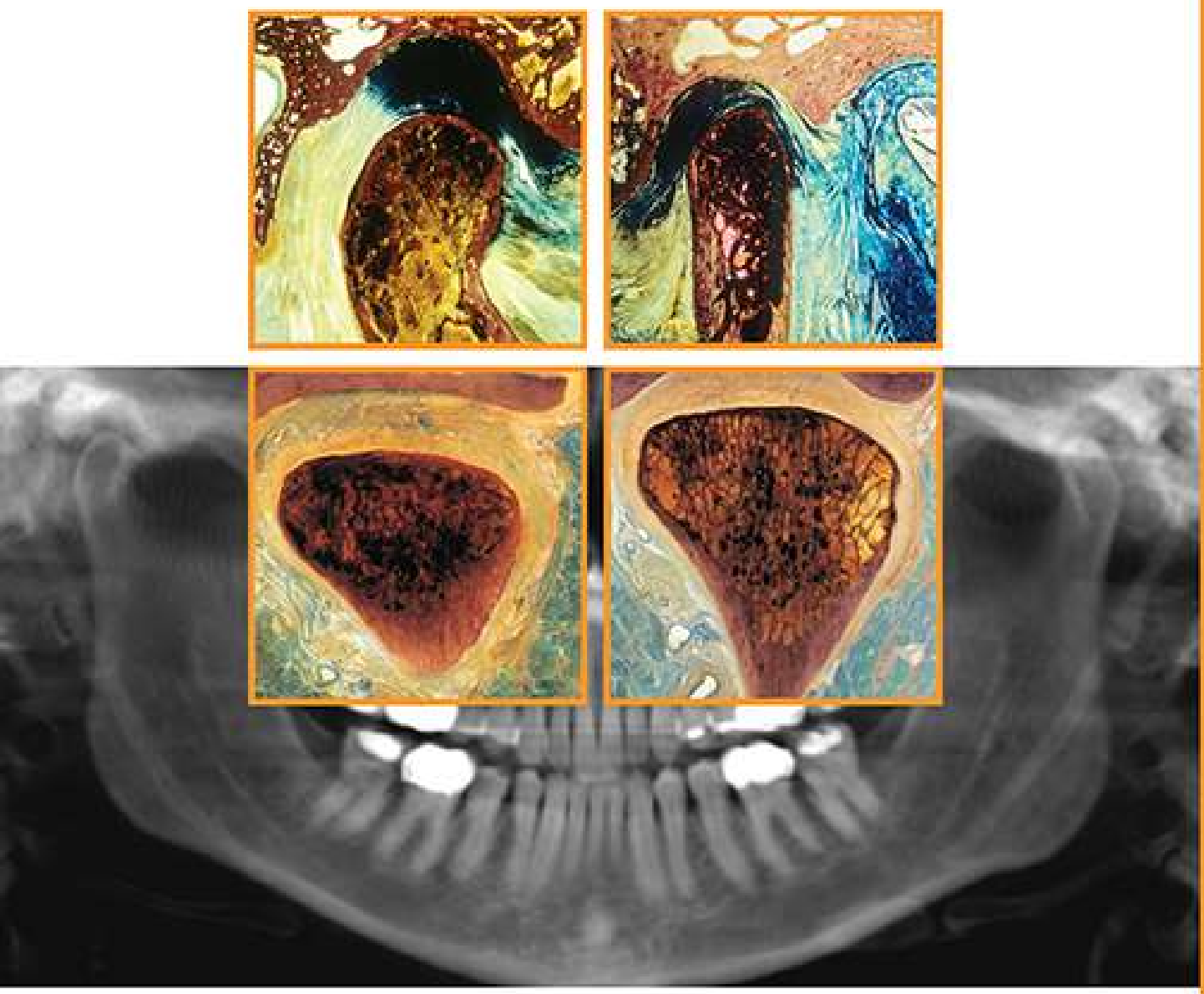

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ARTICLE

Severity and form of temporomandibular disorder symptoms: Functional, physical, and psychosocial impacts

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ABSTRACT

Objective: The associations between the presence of differing severity/form of temporomandibular disorder (TMD) symptoms and oral health-related quality of life (OHRQoL) were explored.

Methods: The severity and form of TMDs in young adults were categorized based on the Fonseca Anamnestic Index (FAI) and Diagnostic Criteria for TMDs (DC/TMD), and OHRQoL was assessed with the Oral Health Impact Profile-14 (OHIP-14). Data were analyzed using non-parametric statistics ($\alpha = 0.05$).

Results: The study cohort consisted of 501 young adults (mean age 19.7 ± 1.3 years; 75.2% women). Participants with severe/moderate TMDs had significantly higher OHIP severity scores than those with mild/no TMDs. Moreover, participants with combined/pain-related symptoms exhibited significantly higher severity scores compared to those without symptoms. The physical pain and psychological discomfort domains were typically more impaired regardless of severity/form of TMD symptoms.

Conclusion: More severe and painful symptoms were related to greater impairments in OHRQoL, especially in the physical and psychological domains.

KEYWORDS
Temporomandibular disorders; symptoms; oral health-related quality of life

Introduction

Over the last decade, interest in patient-reported measures, especially oral health-related quality of life (OHRQoL), has increased considerably in dental research, education, clinical practice, and health policy development [1]. OHRQoL is a multi-dimensional construct that reflects an individual's oral health, functional and emotional well-being, expectations and satisfaction with care, as well as self-esteem [2]. Clinically, OHRQoL is essential for determining and monitoring the perceived biopsychosocial impacts of oral diseases/conditions on patients' lives and outcomes of therapeutic interventions/programs. Furthermore, it can help distinguish the degree/type of problems encountered and facilitate communications as well as shared decision-making, including treatment prioritization between patients and clinicians [1,2]. Different approaches, such as social indicators, global self-ratings, and multiple-item questionnaires, have been taken to assess OHRQoL [3]. Generic or condition-specific multiple-item surveys are more widely used [3], of which the short-form version of the Oral Health Impact Profile-14 (OHIP-14) is particularly popular [4,5]. The OHIP-14 is a validated "self-rating patient-centered" instrument that comprises seven theoretical domains, namely functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap, founded on Locker's conceptual framework for oral health [6]. It has been translated into numerous languages and applied to diverse oral diseases/conditions, including temporomandibular disorders (TMDs) [7–10].

TMDs are a heterogeneous group of medical and dental conditions affecting the temporomandibular joints (TMJs), masticatory muscles, and adjoining structures. They are a common cause of orofacial pain, with prevalence rates of up 7% in adolescents and 15% in adults [11]. Women, especially those aged 20 to 40 years, are at increased risk of TMDs [12]. Symptoms of TMDs consist of headaches, masticatory muscle pain, TMJ pain (earaches) and sounds, as well as jaw opening and movement difficulties/limitations. The multidimensional etiology of TMDs is congruent with the "biopsychosocial model of illness" [13]. Psychological factors involved include depression, anxiety, stress, and somatization [14,15]. Functional, physical, and psychological symptoms/disabilities associated with TMDs may impair the OHRQoL of individuals [9,10].

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Research relating OHRQoL to TMDs has been conducted primarily on TMD patients, with OHIP-14 being the most often used measure [9,10]. Collectively, the studies indicated that OHRQoL was negatively affected by TMDs. Furthermore, the effect seemed more pronounced with more and painful TMD signs/symptoms [9,10]. TMDs, especially when severe, were also determined to worsen health-related QoL [16]. More recently, women with impaired OHRQoL (total OHIP-scores >14) were found to be three times more likely to report TMD symptoms [17].

Given the relatively fewer number of general population studies [18,19], additional research on the impact of TMD symptoms on OHRQoL of community samples is desirable. The latter is clinically relevant, considering the trend toward an increasing prevalence of TMDs in youths and adults and the substantial proportion of prospective dental patients presenting with co-morbid clinical or subclinical TMD symptoms [20–22]. Furthermore, most prior OHRQoL studies had evaluated OHIP data in terms of mean/median (severity) scores that may conceal critically different response patterns and be "inherently meaningless" [23]. Hence, the objectives of this study were to examine the associations between the presence of differing severity as well as form of TMD symptoms and OHRQoL. In addition, the functional, physical, and psychosocial impacts of the various TMD severity/symptoms were compared together with three formats of OHRQoL data appraisal. The null hypotheses were as follows: (a) severity and form of TMD symptoms do not affect OHRQoL; (b) OHRQoL domains are not impacted similarly by the various TMD severity/symptoms; and (c) no difference in outcomes ensues when OHRQoL is assessed by severity, extent, and prevalence.

Materials and methods

Study participants

The protocol for the study was approved by the ethics committee of the Trisakti University School of Dentistry, Indonesia (protocol no: 244/S3/KEPK/FKG/2/2019). Participants were recruited from all faculties of Trisakti University using a convenience sampling technique. The inclusion criteria were young adults aged 18 to 22 years and the absence of cognitive impairments, debilitating illness, and craniofacial trauma. Exclusion criteria included a history of psychiatric treatment, known systemic diseases, and incomplete questionnaires. The minimum sample size (n = 448) was calculated using the G*power software (version 3.1.9.2) [24], based on the Wilcoxon-Mann-Whitney model, an effect size of 0.50, alpha error 0.05, power of 95%, and allocation ratio of 6 [19]. Participation in the study was voluntary and anonymous. Details of the study were provided, and informed consent was obtained before commencing the electronic survey. The latter was comprised of the Fonseca Anamnestic Index (FAI) [25], DC/TMD-Symptoms Questionnaire (SQ) [26,27], and the OHIP-14 [5] and was administered via Google forms over three months.

Measures

The severity and form of TMD symptoms were categorized based on the FAI and DC/TMD-SQ, respectively. The psychometric properties of the FAI have been widely corroborated [28,29]. It consists of 10 items relating to pain-related (TMJ pain, masticatory muscle pain, headaches, and neck pain), function-related (TMJ sounds, jaw opening and movement difficulties), and other (teeth clenching/grinding, malocclusion, and emotional stress) TMD symptoms/features. The questions are scored on a 3-point response scale (no = 0 points, sometimes = 5 points, and yes = 10 points), summed, and stratified as follows: no (0–15 points), mild (20–40 points), moderate (45–65 points), and severe (70–100 points) TMDs. Participants were consequently classified into no (NT), mild (MT), moderate (RT), and severe (ST) TMD groups, based on the severity of TMD symptoms. The DC/TMD-SQ collects the essential history for deriving physical (Axis I) TMD diagnoses. It involves 14 items concerning TMJ/masticatory muscle pain, headaches attributed to TMDs, TMJ sounds, and closed as well as opening locking of the TMJs. Just as common TMD conditions are classified into pain-related and intra-articular disorders [26], participants were classified into no/absence of TMDs (AT), pain-related (PT), intra-articular (IT), and combined (CT) TMD groupings, based on the form of TMD symptoms. Positive responses to the principal questions on TMD pain/headaches and TMJ sounds/closed or opening locking were used to identify the absence or presence of painful, intra-articular TMJ, and combined (both PT and IT) TMD symptoms, accordingly.

OHRQoL was assessed with the OHIP-14, which contains 14 items and seven domains. The questions are scored on a 5-point response scale (0 = never to 4 = very often), based on experience in the past month with two items assigned to each domain. The OHIP-14 responses were subsequently examined in three formats, namely severity, extent, and prevalence, as proposed by Slade et al. [30]. Total/domain-OHIP severity-scores were obtained by totaling the ordinal values for all 14 or domain-specific items. Larger severity scores denote

greater impairments to quality of life and poorer OHRQoL. Total/domain extent scores and prevalence were determined by the number of items reported as "fairly often" and "very often" (i.e., FOVO) and the percentage of subjects reporting one or more FOVO responses, respectively.

Statistical analysis

The IBM SPSS Statistics for Windows software Version 24.0 (IBM Corporation, Armonk, NY, USA) was employed for statistical analyses with the significance level set at 0.05. OHIP severity and extent scores were summarized as means (standard deviations) and medians (interquartile ranges), while FOVO prevalence was presented as frequencies with percentages. The Kolmogorov-Smirnov test was applied to confirm the normality of OHIP data. As data were not normally distributed, the Kruskal-Wallis and Mann-Whitney U tests were used to compare severity/extent scores among TMD groups. Differences in FOVO prevalence was assessed with chi-square and pairwise Z tests. Spearman's rho correlation was employed to relate total/domain-OHIP severity scores, extent scores, and prevalence rates. Correlation coefficients (r_s) were afterward stratified as follows: weak (0.1–0.3), moderate (0.4–0.6), or strong (0.7–0.9) [31].

Results

Of the 590 eligible individuals contacted, 89 declined involvement in the study, giving a response rate of 84.9%. The final sample (n = 501) consisted of 75.2% women and 24.8% men, with a mean age of 19.7 ± 1.3 years. Of these, 40.7%, 49.9%, 8.8%, and 0.6% were classified with NT, MT, RT, and ST, respectively, while 39.5%, 26.3%, 12.8%, and 21.4% had AT, PT, IT, and CT symptoms, accordingly. The mean and median OHIP severity and extent scores are presented in Tables 1 and 2, while FOVO prevalence rates are shown in Table 3. Centered on the severity of TMD symptoms, significant differences in total-OHIP were as follows: Severity score: ST, RT > MT > NT; extent score: ST > RT, MT > NT; and prevalence rate: RT > MT > NT. Based upon the form of TMD symptoms, significant differences in total-OHIP were as follows: severity score: CT, PT > IT, AT; extent score: CT, PT > AT and CT > IT; and prevalence rate: CT, PT > AT.

Significant differences in domain severity/extent scores and prevalence varied somewhat between the various groups and are reflected in the post-hoc columns of Tables 1–3. Some OHIP-domain trends established for the severity of TMDs were severity score: ST, RT, MT > NT for all domains except functional limitation and ST, RT > MT for physical pain, psychological discomfort, and disability; extent-score: ST, RT > NT for most domains besides functional limitation, psychological discomfort, and handicap; prevalence rate: ST and/or RT > NT for all domains. OHIP-domain trends based on the form of TMD symptoms were severity score: CT, PT > AT for all domains and CT > IT for all domains except functional limitation; extent score: CT, PT > AT for most domains besides function limitation, social disability, and handicap and CT > IT for physical and psychological disability; prevalence rate: CT > AT for most domains except for functional limitation, social disability, and handicap ($p < 0.001$).

The two domains that were most impaired (highest severity scores) were physical pain and disability for the ST group, psychological discomfort and disability for the RT group, and physical pain and psychological discomfort for the MT group. Likewise, the two domains with the greatest severity scores were physical pain and psychological discomfort for the CT, PT, and IT groups. Although the correlations among OHIP severity scores, extent scores, and prevalence were significant ($p < 0.001$), correlations were mostly weak ($r_s = 0.17$ to 0.34) except between extent-scores and prevalence rates. Correlations for the latter were strong with coefficients (r_s) ranging from 0.96 to 1.00.

Discussion

General overview

This study investigated the associations between the presence of differing severity/form of TMD symptoms and OHRQoL. The biopsychosocial impacts of various TMD symptoms were also compared with three formats of OHRQoL assessment. As the severity/form of TMD symptoms affected OHRQoL, and the three formats of OHIP appraisal led to disparate outcomes, the first and third null hypotheses were rejected. The second null hypothesis was accepted, as some OHIP domains were impaired more than others. Young adults were chosen for the present study, as they represented the majority of TMD patients and the peak age range for occurrence of TMD symptoms [15]. The generic OHIP-14 was selected over a condition-specific OHRQoL measure, like the OHIP-TMDs [32], to facilitate comparison with other oral conditions and findings from earlier TMD work. Mean severity scores were also displayed for the latter reasons. TMD symptoms were common and present in about 60% of the cohort of young adults. Findings agreed with prior system reviews, indicating a high

Table 1. Mean and median OHIP severity scores by severity and form of TMD symptoms.

Severity of TMD symptoms							
OHIP domain		NT n = 204	MT n = 250	RT n = 44	ST n = 3	*p*-value	Post-hoc
Functional limitation	Mean ± SD	0.50 ± 0.95	1.13 ± 1.54	1.80 ± 1.94	1.67 ± 1.53	<0.001	RT, MT > NT
	Median (IQR)	0 (0–1)	0 (0–2)	1 (0–3)	2 (0–2)		
Physical pain	Mean ± SD	1.59 ± 1.56	2.35 ± 1.73	3.07 ± 1.65	7.33 ± 1.15	<0.001	ST, RT > MT > NT
	Median (IQR)	1 (0–2)	2 (1–3.25)	3 (2–4)	8 (6–8)		
Psychological discomfort	Mean ± SD	1.48 ± 1.70	2.40 ± 2.03	3.57 ± 2.40	5.33 ± 1.15	<0.001	ST, RT > MT > NT
	Median (IQR)	1 (0–2.75, 0–8)	2 (1–4)	4 (2–6)	6 (4–6)		
Physical disability	Mean ± SD	1.16 ± 1.42	2.08 ± 1.83	2.77 ± 2.21	6.33 ± 2.08	<0.001	ST, RT, MT > NT
	Median (IQR)	1 (0–2)	2 (0.75–3)	3 (0–5)	7 (4–7)		
Psychological disability	Mean ± SD	1.20 ± 1.54	2.06 ± 1.78	3.30 ± 2.17	5.67 ± 0.58	<0.001	ST, RT > MT > NT
	Median (IQR)	1 (0–2)	2 (0–3)	3.5 (1.25–5)	6 (5–6)		
Social disability	Mean ± SD	0.60 ± 1.22	1.36 ± 1.60	2.25 ± 2.27	5.33 ± 2.52	<0.001	ST, RT, MT > NT
	Median (IQR)	0 (0–1)	1 (0–2)	2 (0–4)	5 (3–5)		
Handicap	Mean ± SD	0.66 ± 1.21	1.43 ± 1.62	2.11 ± 1.81	5.33 ± 2.52	<0.001	ST, RT, MT > NT
	Median (IQR)	0 (0–1)	1 (0–2)	2 (0.25–3)	5 (3–5)		
Total OHIP	Mean ± SD	7.19 ± 7.25	12.81 ± 8.66	18.86 ± 11.78	37 ± 10	<0.001	ST, RT > MT > NT
	Median (IQR)	5 (2–10)	11 (6–18)	19 (9.5–26)	37 (27–37)		
Form of TMD symptoms							
OHIP domain		AT n = 198	PT n = 132	IT n = 64	CT n = 107	*p*-value	Post-hoc
Functional limitation	Mean ± SD	0.66 ± 1.26	1.21 ± 1.50	0.91 ± 1.55	1.12 ± 1.49	<0.001	PT, CT > AT
	Median (IQR)	0 (0–1)	1 (0–2)	0 (0–1)	0 (0–2)		
Physical pain	Mean ± SD	1.70 ± 1.53	2.39 ± 1.75	1.75 ± 1.63	2.84 ± 1.96	<0.001	CT, PT > ATCT > IT
	Median (IQR)	2 (0–3)	2 (1–4)	2 (0–3)	3 (1–4)		
Psychological discomfort	Mean ± SD	1.61 ± 1.81	2.47 ± 2.17	1.78 ± 1.69	2.97 ± 2.16	<0.001	CT, PT > ATCT > IT
	Median (IQR)	1 (0–3)	2 (0–4)	1 (0–3)	3 (1–5)		
Physical disability	Mean ± SD	1.26 ± 1.53	2.20 ± 1.88	1.33 ± 1.49	2.54 ± 2.06	<0.001	CT, PT > IT, AT
	Median (IQR)	1 (0–2)	2 (1–4)	1 (0–2)	2 (1–4)		
Psychological disability	Mean ± SD	1.27 ± 1.55	2.08± 1.89	1.53 ± 1.61	2.76 ± 2.02	<0.001	CT, PT > ATCT > IT
	Median (IQR)	1 (0–2)	2 (0–3)	1 (0–3)	3 (1–4)		
Social disability	Mean ± SD	0.87 ± 1.47	1.42 ± 1.80	0.72 ± 1.23	1.61 ± 1.81	<0.001	CT, PT > IT, AT
	Median (IQR)	0 (0–1)	1 (0–2)	0 (0–1)	1 (0–3)		
Handicap	Mean ± SD	0.92 ± 1.45	1.41 ± 1.65	0.94 ± 1.42	1.62 ± 1.76	<0.001	CT, PT > ATCT > IT
	Median (IQR)	0 (0–1)	1 (0–2)	0 (0–1.75)	1 (0–3)		
Total OHIP	Mean ± SD	8.29 ± 8.09	13.19 ± 8.97	8.95 ± 8.67	15.46 ± 10.38	<0.001	CT, PT > IT, AT
	Median (IQR)	6 (3–11)	11.5 (6–18.75)	6 (2–13.75)	13 (7–23)		

TMD: Temporomandibular disorders; OHIP: Oral health impact profile; NT: no TMDs; M: Mild TMDs; RT: Moderate TMDs; ST: Severe TMDs; PT: Pain-related TMDs; IT: Intra-articular TMDs; CT: Combined TMDs. Results of Kruskal-Wallis and Mann-Whitney U test with Bonferroni correction ($p < 0.05$).

prevalence of TMD signs/symptoms in the general population and highlighted the importance of routine TMD screening in dental practice [20,21].

Severity of TMD symptoms

Total-OHIP severity scores increased with greater TMD severity, and mean scores ranged from 7.19 ± 7.25 to 18.86 ± 11.78 for no to moderate TMDs. Findings paralleled those of a recent study by Fuller et al. [33] that reported mean total OHIP severity scores varying from 5.20 ± 6.62 to 14.89 ± 10.76 for no to moderate-severe periodontal disease. Although the mean total OHIP scores for the severe TMD group was about 5 times that of the no TMD group, its sample size was exceedingly small, as with other research based on the FAI [34]. Findings for the severe TMD group, thus, cannot be extrapolated due to possible latent errors.

While between-group differences in total OHIP severity scores and prevalence were similar (i.e., RT > MT > NT), outcomes for extent-scores varied slightly (i.e., RT, MT > NT). However, findings for domain severity scores, extent scores, and FOVO prevalence fluctuated considerably, revealing different patterns in responses among the TMD severity groupings (Tables 1–3). It is, thus, prudent that OHRQoL data be assessed using all three formats until meaningful OHIP severity benchmarks are established [27], which is all the more important for differentiating the form of TMD symptoms Table 4.

Form of TMD symptoms

Mean total OHIP severity scores varied from 13.19 ± 8.97 to 15.46 ± 10.38 for participants with painful TMD symptoms (i.e., PT/CT groups) and ranged from 8.29 ± 8.09 to 8.95 ± 8.67 for the AT and IT groups. The mean severity scores attained agreed with those reported by Almoznino et al. [35] for muscle and joint pain (13.20 ± 7.85) based on the RDC/TMD. Findings also concurred with the work of Filho et al.

Table 2. Mean and median FOVO extent scores by severity and form of TMD symptoms.

Severity of TMD symptoms							
OHIP domain		NT n = 204	MT n = 250	RT n = 44	ST n = 3	*p*-value	Post-hoc
Functional limitation	Mean ± SD	0.2 ± 0.16	0.10± 0.34	0.27 ± 0.54	0.33 ± 0.58	<0.001	RT > MT > NT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)		
Physical pain	Mean ± SD	0.10 ± 0.36	0.20 ± 0.49	0.32 ± 0.60	2 ± 0	<0.001	ST > RT > NT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0.75)	2 (2–2)		
Psychological discomfort	Mean ± SD	0.17± 0.40	0.36 ± 0.56	0.61 ± 0.72	1 ± 1	<0.001	RT, MT > NT
	Median (IQR)	0 (0–0)	0 (0–1)	0 (0–1)	1 (0–1)		
Physical disability	Mean ± SD	0.05 ± 0.24	0.19 ± 0.51	0.43 ± 0.62	1.67 ± 0.58	<0.001	ST > RT > MT > NT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–1)	2 (1–2)		
Psychological disability	Mean ± SD	0.09 ± 0.31	0.30 ± 0.52	0.57 ± 0.70	1 ± 0	<0.001	ST, RT > MT > NT
	Median (IQR)	0 (0–0)	0 (0–1)	0 (0–1)	1 (1–1)		
Social disability	Mean ± SD	0.04 ± 0.19	0.12 ± 0.36	0.25 ± 0.58	1 ± 1	<0.001	ST > RT > NT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	1 (0–1)		ST > MT
Handicap	Mean ± SD	0.06 ± 0.29	0.16 ± 0.40	0.18 ± 0.45	1.33 ± 0.58	<0.001	ST > MT > NT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	1 (1–1)		ST > RT
Total OHIP	Mean ± SD	0.53 ± 1.31	1.42 ± 1.97	2.64 ± 3.22	8.33 ± 2.31	<0.001	ST > RT, MT > NT
	Median (IQR)	0 (0–0)	0 (0–2)	0 (0–3)	7 (7–7)		
Form of TMD symptoms							
OHIP domain		AT n = 198	PT n = 132	IT n = 64	CT n = 107	*p*-value	Post-hoc
Functional limitation	Mean ± SD	0.06 ± 0.27	0.08 ± 0.30	0.11 ± 0.36	0.14 ± 0.37	0.067	Not applicable
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)		
Physical pain	Mean ± SD	0.09 ± 0.31	0.18 ± 0.48	0.16 ± 0.41	0.37 ± 0.68	<0.001	CT > PT, AT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–1)		
Psychological discomfort	Mean ± SD	0.19 ± 0.43	0.37 ± 0.58	0.25 ± 0.44	0.49 ± 0.66	<0.001	CT, PT > AT
	Median (IQR)	0 (0–0)	0 (0–1)	0 (0–0.75)	0 (0–1)		
Physical disability	Mean ± SD	0.08 ± 0.34	0.22 ± 0.51	0.06 ± 0.24	0.30 ± 0.62	<0.001	CT, PT > AT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)		CT > IT
Psychological disability	Mean ± SD	0.14 ± 0.36	0.30 ± 0.52	0.11 ± 0.31	0.44 ± 0.63	<0.001	CT, PT > AT
	Median (IQR)	0 (0–0)	0 (0–1)	0 (0–0)	0 (0–1)		CT > IT
Social disability	Mean ± SD	0.06 ± 0.26	0.15 ± 0.44	0.05 ± 0.21	0.15 ± 0.41	0.059	Not applicable
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)		
Handicap	Mean ± SD	0.09 ± 0.32	0.17 ± 0.41	0.08 ± 0.37	0.18 ± 0.43	0.063	Not applicable
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)		
Total OHIP	Mean ± SD	0.70 ± 1.54	1.47 ± 2.14	0.81 ± 1.64	2.07 ± 2.64	<0.001	CT, PT > AT
	Median (IQR)	0 (0–1)	0 (0–2)	0 (0–1)	1 (0–3)		CT > IT

TMD: Temporomandibular disorders; OHIP: Oral health impact profile; FOVO: Fairly often and very often; NT: no TMDs; M: Mild TMDs; RT: Moderate TMDs; ST: Severe TMDs; PT: Pain-related TMDs; IT: Intra-articular TMDs; CT: Combined TMDs. Results of Kruskal-Wallis and Mann-Whitney U test with Bonferroni correction ($p < 0.05$).

Table 3. FOVO prevalence rates by severity and form of TMD symptoms.

Severity of TMD symptoms							
OHIP domain	Total % (n)	NT % (n)	MT % (n)	RT % (n)	ST % (n)	*p*-value	Post-hoc
Functional limitation	7.8 (39)	2.5 (5)	9.2 (23)	22.7 (10)	33.3 (1)	<0.001	RT > NT
Physical pain	14.2 (71)	7.8 (16)	16.4 (41)	25 (11)	100 (3)	<0.001	ST > NT
Psychological discomfort	26.7 (134)	16.2 (33)	31.2 (78)	47.7 (21)	66.7 (2)	<0.001	RT > NT
Physical disability	12.4 (62)	4.4 (9)	13.6 (34)	36.4 (16)	100 (3)	<0.001	RT, ST > NT
Psychological disability	21.6 (108)	8.8 (18)	26.8 (87)	45.5 (20)	100 (3)	<0.001	RT > NT
Social disability	8.8 (44)	3.9 (8)	10.4 (26)	18.2 (8)	66.7 (2)	<0.001	ST > NT
Handicap	11.2 (56)	4.4 (9)	14.8 (37)	15.9 (7)	100 (3)	<0.001	ST, MT > NT
Total OHIP	39.5 (198)	22.1 (45)	48 (120)	68.2 (30)	100 (3)	<0.001	RT > MT > NT
Form of TMD symptoms							
OHIP domain	Total % (n)	AT % (n)	PT % (n)	IT % (n)	CT % (n)	*P*-value	Post-hoc
Functional limitation	7.8 (39)	4.5 (9)	7.6 (10)	9.4 (6)	13.1 (14)	0.063	Not applicable
Physical pain	14.2 (71)	7.6 (15)	14.4 (19)	14.1 (9)	26.2 (28)	<0.001	CT > AT
Psychological discomfort	26.7 (134)	17.2 (34)	31.8 (42)	25 (16)	39.3 (42)	<0.001	CT > AT
Physical disability	12.4 (62)	6.1 (12)	17.4 (23)	6.3 (4)	21.5 (23)	<0.001	CT > AT
Psychological disability	21.6 (108)	13.6 (27)	26.5 (35)	10.9 (7)	36.4 (39)	<0.001	CT > AT
Social disability	8.8 (44)	5.6 (11)	12.1 (16)	4.7 (3)	13.1 (14)	0.042	Not applicable
Handicap	11.2 (56)	8.1 (16)	15.2 (20)	4.7 (3)	15.9 (17)	0.028	Not applicable
Total OHIP	39.5 (198)	26.3 (52)	48.5 (64)	35.9 (23)	55.1 (59)	<0.001	CT, PT > AT

TMD: Temporomandibular disorders; OHIP: Oral health impact profile; FOVO: Fairly often and very often; NT: no TMDs; M: Mild TMDs; RT: Moderate TMDs; ST: Severe TMDs; PT: Pain-related TMDs; IT: Intra-articular TMDs, CT: Combined TMDs. Results of chi-square and pair-wise Z tests ($p < 0.05$).

Table 4. Correlation among the severity scores, extent scores, and prevalence rates (n = 501).

OHIP domain	Severity & extent-scores	Severity score & prevalence	Extent score & prevalence
Functional limitation	0.21	0.20	1.00
Physical pain	0.18	0.18	1.00
Psychological discomfort	0.23	0.22	0.99
Physical disability	0.27	0.27	1.00
Psychological disability	0.30	0.29	1.00
Social disability	0.17	017	1.00
Handicap	0.19	0.19	1.00
Total OHIP	0.34	0.32	0.96

OHIP: Oral health impact profile, Spearman's rho correlation. All *p*-values <0.001.

[17] that indicated women with total OHIP scores >14 were at greater risk of experiencing TMD symptoms. Participants with painful TMDs had significantly higher total OHIP severity/extent scores and FOVO prevalence than those with no TMD symptoms (CT, PT > AT). Additionally, the non-painful IT group had significantly lower total OHIP severity scores than CT/PT groups and lower extent scores than the CT group. These findings paralleled those conducted on clinical samples and may be explained by possible functional, physical, and psychosocial impairments associated with TMD pain [9,10].

Outcomes for between-group comparisons of OHIP domains were again dependent on the OHIP appraisal format applied. While significant differences in severity scores were noted for all domains, extent scores and FOVO prevalence were only statistically significant for the physical pain, physical disability, psychological discomfort, and psychological disability domains. Findings further substantiated the necessity for OHIP data to be assessed in different formats besides severity and validated the work of Yap et al. [36], based on the OHIP-TMDs.

These authors concluded that TMDs impacted the physical and psychosocial well-being of young adults and advocated the appraisal of OHRQoL by severity as well as extent, and/or prevalence.

Impacts and correlations

For both severity and form of TMD symptoms, the most compromised OHIP domains were physical pain/disability and psychological discomfort/disability. The same observations were also reported for TMD patients [35]. Results validated the belief that physical and psychological "ailments" caused by TMDs lower quality of life [10]. Collectively, the findings underscore the importance of addressing any associated psychological difficulties/conditions when managing physical pain in TMD patients. This may include counseling, stress management, psychotherapy, as well as positive psychology interventions like mindfulness meditation [37]. The functional limitation, social disability, and handicap domains were not markedly impaired even in TMD patients [35]. Functional limitations, in particular, were found to be influenced more by pain intensity than pain chronicity and intra-articular disorders [38]. Findings supported the utility of OHIP-14 for identifying clinical problems and prioritizing care as well as treatment outcomes.

Besides extent scores and prevalence, correlations among the three formats of OHIP appraisal were generally weak. However, the associations between FOVO extent scores and prevalence rates were strong, with almost perfect correlations for total OHIP (r_s = 0.96) and the different OHIP domains (r_s = 0.99–1.00). Correlation coefficients were comparable to those obtained for the OHIP-TMDs, which was specifically designed to draw on TMD symptoms and has greater sensitivity, specificity, and responsiveness, as well as lower "floor effects" (i.e., no impact) [32]. For scientific reporting purposes, FOVO prevalence is preferred over extent scores, as it is simpler to analyze and interpret. Nonetheless, severity scores should still be maintained as the key descriptive reporting benchmark, given its widespread use and ease of understanding/comparison.

Study limitations

There were several limitations associated with the study design and data collected. First, the study involved only young adults and not mature ones, who might have a higher frequency of TMD pain and lower OHRQoL in the physical pain domain [19]. Furthermore, the young adults recruited were studying in higher education and may experience more academic stressors and psychological distress [39]. Second, the TMD symptoms were self-reported, and no clinical or radiographic examinations were performed to verify the TMD features. Responses may be subject to various biases arising from sampling approach, social desirability, selective recall, as well as recall periods [39]. To minimize possible convenience sampling and non-response biases, multiple samples were randomly recruited from different schools, and a high response rate was achieved. Third, other oral conditions, such as dental caries, periodontal disease, and wisdom tooth problems, as well as TMD pain intensity and chronicity that could affect OHRQoL, were not accounted for. Therefore, further studies could incorporate older and non-schooling

community samples, physical examinations, as well as the collection of data on other dental conditions and TMD characteristics.

Conclusion

This study indicated that TMD symptoms were present in about three-fifths of the cohort of young adults and provided further support for the high prevalence of TMDs in the general population. Efforts should, thus, be made to screen all patients for TMDs in dental practice, especially since TMDs have been reported to negatively impact patients' quality of life. OHRQoL outcomes were found to be influenced by the severity and form of TMD symptoms as well as formats of OHIP appraisal. More severe and painful TMD symptoms were associated with greater impairments in quality of life, especially in the physical and psychological domains. The functional limitation, social, and handicap domains appeared to be less affected. OHIP data should ideally be examined in different formats, preferably severity and extent or prevalence, given the strong correlations between the latter methods. Clinically, the OHIP-14 may be useful for identifying problems and prioritizing care/treatment outcomes from the patients' perspective.

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Data availability statement

Data for this study are available from the corresponding author upon reasonable request.

Disclosure statement

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References

[1] Rozier RG, Pahel BT. Patient- and population-reported outcomes in public health dentistry: oral health-related quality of life. Dent Clin North Am. 2008;52(2):345–365.
[2] Sischo L, Broder HL. Oral health-related quality of life: what, why, how, and future implications. J Dent Res. 2011;90(11):1264–1270.
[3] Bennadi D, Reddy CV. Oral health related quality of life. J Int Soc Prev Community Dent. 2013;3(1):1–6.
[4] Slade GD, Spencer AJ. Development and evaluation of the oral health impact profile. Community Dent Health. 1994;11(1):3–11.
[5] Slade GD. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol. 1997;25(4):284–290.
[6] Locker D. Measuring oral health: a conceptual framework. Community Dent Health. 1988;5(1):3–18.
[7] Wong LB, Yap AU, Allen PF. Periodontal disease and quality of life: umbrella review of systematic reviews. J Periodontal Res. 2021;56(1):1–17.
[8] Andiappan M, Gao W, Bernabé E, et al. Malocclusion, orthodontic treatment, and the oral health impact profile (OHIP-14): systematic review and meta-analysis. Angle Orthod. 2015;85(3):493–500. DOI:10.2319/051414-348.1.
[9] Dahlström L, Carlsson GE. Temporomandibular disorders and oral health-related quality of life. A systematic review. Acta Odontol Scand. 2010;68(2):80–85. DOI:10.3109/00016350903431118.
[10] Bitiniene D, Zamaliauskiene R, Kubilius R, et al. Quality of life in patients with temporomandibular disorders. A systematic review. Stomatologija 2018;20(1):3–9.
[11] List T, Jensen RH. Temporomandibular disorders: old ideas and new concepts. Cephalalgia. 2017;37(7):692–704.
[12] Bueno CH, Pereira DD, Pattussi MP, et al. Gender differences in temporomandibular disorders in adult populational studies: a systematic review and meta-analysis. J Oral Rehabil. 2018;45(9):720–729. DOI: 10.1111/joor.12661.
[13] Slade GD, Fillingim RB, Sanders AE, et al. Summary of findings from the OPPERA prospective cohort study of incidence of first-onset temporomandibular disorder: implications and future directions. J Pain. 2013;14(12 Suppl):T116–124. DOI: 10.1016/j.jpain.2013.09.010.
[14] De La Torre Canales G, Câmara-Souza MB, Muñoz Lora VRM, et al. Prevalence of psychosocial impairment in temporomandibular disorder patients: a systematic review. J Oral Rehabil. 2018;45(11):881–889. DOI: 10.1111/joor.12685.
[15] Yap AU, Cao Y, Zhang MJ, et al. Age-related differences in diagnostic categories, psychological states and oral health-related quality of life of adult temporomandibular disorder patients. J Oral Rehabil. 2021. Epub ahead of print.
[16] Foger D, Peralta-Mamani M, Santos Paulo S. Impact of temporomandibular disorders on quality of life. Fisioter Mov. 2020;33: e003320. DOI: 10.1590/1980-5918.033.ao20.

[17] Filho JC, Vedovello SAS, Venezian GC, et al. Women's oral health-related quality of life as a risk factor for TMD symptoms. A case-control study. CRANIO®. 2020;1–5. Epub ahead of print. DOI:10.1080/08869634.2020.1833159.
[18] Yamane-Takeuchi M, Ekuni D, Mizutani S, et al. Associations among oral health-related quality of life, subjective symptoms, clinical status, and self-rated oral health in Japanese university students: a cross-sectional study. BMC Oral Health. 2016 30;16(1):127. DOI:10.1186/s12903-016-0322-9.
[19] Gillborg S, Åkerman S, Lundegren N, et al. Temporomandibular disorder pain and related factors in an adult population: a cross-sectional study in Southern Sweden. J Oral Facial Pain Headache. 2017;31(1):37–45. DOI:10.11607/ofph.1517.
[20] Joseph R, Rahena A, Hassan N. et al. Epidemiology of temporomandibular disorder in the general population: a systematic review. Adv Dent Oral Health. 2019;10(3):555787.
[21] Lai YC, Yap AU, Türp JC. Prevalence of temporomandibular disorders in patients seeking orthodontic treatment: a systematic review. J Oral Rehabil. 2020;47(2):270–280.
[22] Adèrn B, Minston A, Nohlert E, et al. Self-reportance of temporomandibular disorders in adult patients attending general dental practice in Sweden from 2011 to 2013. Acta Odontol Scand. 2018;76(7):530–534. DOI:10.1080/00016357.2018.1487076.
[23] Tsakos G, Allen PF, Steele JG, et al. Interpreting oral health-related quality of life data. Community Dent Oral Epidemiol. 2012;40(3):193–200. DOI:10.1111/j.1600-0528.2011.00651.x.
[24] Faul F, Erdfelder E, Lang AG, et al. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods. 2007;39:175–191.
[25] Fonseca DM, Bonfante G, Valle AL. et al. Diagnosis by anamnesis of craniomandibular dysfunction [Diagnóstico pela anamneses da disfunção craniomandibular]. Rev Gaúcha Odontol. 1994;42(1):23–32.
[26] Schiffman E, Ohrbach R, Truelove E, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: recommendations of the International RDC/TMD consortium network and orofacial pain special interest group. J Oral Facial Pain Headache. 2014;28:6–27.
[27] The international network for orofacial pain and related methodology (INfORM) [homepage], diagnostic criteria for temporomandibular disorders symptom questionnaire. [cited 2019 Jun 15]. Available from: https://ubwp.buffalo.edu/rdc-tmdinternational/tmd-assessmentdiagnosis/dc-tmd/.
[28] Campos JA, Carrascosa AC, Bonafé FS, et al. Severity of temporomandibular disorders in women: validity and reliability of the Fonseca Anamnestic Index. Braz Oral Res. 2014;28:16–21.
[29] Zhang MJ, Yap AU, Lei J, et al. Psychometric evaluation of the Chinese version of the Fonseca anamnestic index for temporomandibular disorders. J Oral Rehabil. 2020;47(3):313–318. DOI: 10.1111/joor.12893.
[30] Slade GD, Nuttall N, Sanders AE, et al. Impacts of oral disorders in the United Kingdom and Australia. Br Dent J. 2005;198(8):489–493. DOI: 10.1038/sj.bdj.4812252.
[31] Dancey CP, Reidy J. Statistics without maths for psychology. 7th ed. London: Pearson; 2017.
[32] Durham J, Steele JG, Wassell RW, et al. Creating a patient-based condition-specific outcome measure for temporomandibular disorders (TMDs): oral health impact profile for TMDs (OHIP-TMDs). J Oral Rehabil. 2011;38(12):871–883. DOI: 10.1111/j.1365-2842.2011.02233.x.
[33] Fuller J, Donos N, Suvan J, et al. Association of oral health-related quality of life measures with aggressive and chronic periodontitis. J Periodontal Res. 2020;55(4):574–580. DOI: 10.1111/jre.12745.
[34] Habib SR, Al Rifaiy MQ, Awan KH, et al. Prevalence and severity of temporomandibular disorders among university students in Riyadh. Saudi Dent J. 2015;27(3):125–130. DOI: 10.1016/j.sdentj.2014.11.009.
[35] Almoznino G, Zini A, Zakuto A, et al. Oral health-related quality of life in patients with temporomandibular disorders. J Oral Facial Pain Headache. 2015;29(3):231–241. DOI: 10.11607/ofph.1413.
[36] Yap AU, Qiu LY, Natu VP, et al. Functional, physical and psychosocial impact of temporomandibular disorders in adolescents and young adults. Med Oral Patol Oral Cir Bucal. 2020;25(2):e188–194. DOI: 10.4317/medoral.23298.
[37] Hilton L, Hempel S, Ewing BA, et al. Mindfulness meditation for chronic pain: systematic review and meta-analysis. Ann Behav Med. 2017;51(2):199–213. DOI: 10.1007/s12160-016-9844-2.
[38] Fetai A, Dedic B, Lajnert V, et al. To what extent are the characteristics of painful temporomandibular disorders predictors of self-reported limitations in jaw function? CRANIO®. 2021. Epub ahead of print. DOI: 10.1080/08869634.2020.1853309.
[39] Althubaiti A. Information bias in health research: definition, pitfalls, and adjustment methods. J Multidiscip Healthc. 2016 4;9:211–217. DOI: 10.2147/JMDH.S104807.

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ARTICLE

Severity and form of temporomandibular disorder symptoms: Functional, physical, and psychosocial impacts

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ABSTRACT

Objective: The associations between the presence of differing severity/form of temporomandibular disorder (TMD) symptoms and oral health-related quality of life (OHRQoL) were explored.

Methods: The severity and form of TMDs in young adults were categorized based on the Fonseca Anamnestic Index (FAI) and Diagnostic Criteria for TMDs (DC/TMD), and OHRQoL was assessed with the Oral Health Impact Profile-14 (OHIP-14). Data were analyzed using non-parametric statistics ($\alpha = 0.05$).

Results: The study cohort consisted of 501 young adults (mean age 19.7 ± 1.3 years; 75.2% women). Participants with severe/moderate TMDs had significantly higher OHIP severity scores than those with mild/no TMDs. Moreover, participants with combined/pain-related symptoms exhibited significantly higher severity scores compared to those without symptoms. The physical pain and psychological discomfort domains were typically more impaired regardless of severity/form of TMD symptoms.

Conclusion: More severe and painful symptoms were related to greater impairments in OHRQoL, especially in the physical and psychological domains.

KEYWORDS
Temporomandibular disorders; symptoms; oral health-related quality of life

Introduction

Over the last decade, interest in patient-reported measures, especially oral health-related quality of life (OHRQoL), has increased considerably in dental research, education, clinical practice, and health policy development [1]. OHRQoL is a multi-dimensional construct that reflects an individual's oral health, functional and emotional well-being, expectations and satisfaction with care, as well as self-esteem [2]. Clinically, OHRQoL is essential for determining and monitoring the perceived biopsychosocial impacts of oral diseases/conditions on patients' lives and outcomes of therapeutic interventions/programs. Furthermore, it can help distinguish the degree/type of problems encountered and facilitate communications as well as shared decision-making, including treatment prioritization between patients and clinicians [1,2]. Different approaches, such as social indicators, global self-ratings, and multiple-item questionnaires, have been taken to assess OHRQoL [3]. Generic or condition-specific multiple-item surveys are more widely used [3], of which the short-form version of the Oral Health Impact Profile-14 (OHIP-14) is particularly popular [4,5]. The OHIP-14 is a validated "self-rating patient-centered" instrument that comprises seven theoretical domains, namely functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap, founded on Locker's conceptual framework for oral health [6]. It has been translated into numerous languages and applied to diverse oral diseases/conditions, including temporomandibular disorders (TMDs) [7–10].

TMDs are a heterogeneous group of medical and dental conditions affecting the temporomandibular joints (TMJs), masticatory muscles, and adjoining structures. They are a common cause of orofacial pain, with prevalence rates of up 7% in adolescents and 15% in adults [11]. Women, especially those aged 20 to 40 years, are at increased risk of TMDs [12]. Symptoms of TMDs consist of headaches, masticatory muscle pain, TMJ pain (earaches) and sounds, as well as jaw opening and movement difficulties/limitations. The multidimensional etiology of TMDs is congruent with the "biopsychosocial model of illness" [13]. Psychological factors involved include depression, anxiety, stress, and somatization [14,15]. Functional, physical, and psychological symptoms/disabilities associated with TMDs may impair the OHRQoL of individuals [9,10].

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Research relating OHRQoL to TMDs has been conducted primarily on TMD patients, with OHIP-14 being the most often used measure [9,10]. Collectively, the studies indicated that OHRQoL was negatively affected by TMDs. Furthermore, the effect seemed more pronounced with more and painful TMD signs/symptoms [9,10]. TMDs, especially when severe, were also determined to worsen health-related QoL [16]. More recently, women with impaired OHRQoL (total OHIP-scores >14) were found to be three times more likely to report TMD symptoms [17].

Given the relatively fewer number of general population studies [18,19], additional research on the impact of TMD symptoms on OHRQoL of community samples is desirable. The latter is clinically relevant, considering the trend toward an increasing prevalence of TMDs in youths and adults and the substantial proportion of prospective dental patients presenting with co-morbid clinical or subclinical TMD symptoms [20–22]. Furthermore, most prior OHRQoL studies had evaluated OHIP data in terms of mean/median (severity) scores that may conceal critically different response patterns and be "inherently meaningless" [23]. Hence, the objectives of this study were to examine the associations between the presence of differing severity as well as form of TMD symptoms and OHRQoL. In addition, the functional, physical, and psychosocial impacts of the various TMD severity/symptoms were compared together with three formats of OHRQoL data appraisal. The null hypotheses were as follows: (a) severity and form of TMD symptoms do not affect OHRQoL; (b) OHRQoL domains are not impacted similarly by the various TMD severity/symptoms; and (c) no difference in outcomes ensues when OHRQoL is assessed by severity, extent, and prevalence.

Materials and methods

Study participants

The protocol for the study was approved by the ethics committee of the Trisakti University School of Dentistry, Indonesia (protocol no: 244/S3/KEPK/FKG/2/2019). Participants were recruited from all faculties of Trisakti University using a convenience sampling technique. The inclusion criteria were young adults aged 18 to 22 years and the absence of cognitive impairments, debilitating illness, and craniofacial trauma. Exclusion criteria included a history of psychiatric treatment, known systemic diseases, and incomplete questionnaires. The minimum sample size (n = 448) was calculated using the G*power software (version 3.1.9.2) [24], based on the Wilcoxon-Mann-Whitney model, an effect size of 0.50, alpha error 0.05, power of 95%, and allocation ratio of 6 [19]. Participation in the study was voluntary and anonymous. Details of the study were provided, and informed consent was obtained before commencing the electronic survey. The latter was comprised of the Fonseca Anamnestic Index (FAI) [25], DC/TMD-Symptoms Questionnaire (SQ) [26,27], and the OHIP-14 [5] and was administered via Google forms over three months.

Measures

The severity and form of TMD symptoms were categorized based on the FAI and DC/TMD-SQ, respectively. The psychometric properties of the FAI have been widely corroborated [28,29]. It consists of 10 items relating to pain-related (TMJ pain, masticatory muscle pain, headaches, and neck pain), function-related (TMJ sounds, jaw opening and movement difficulties), and other (teeth clenching/grinding, malocclusion, and emotional stress) TMD symptoms/features. The questions are scored on a 3-point response scale (no = 0 points, sometimes = 5 points, and yes = 10 points), summed, and stratified as follows: no (0–15 points), mild (20–40 points), moderate (45–65 points), and severe (70–100 points) TMDs. Participants were consequently classified into no (NT), mild (MT), moderate (RT), and severe (ST) TMD groups, based on the severity of TMD symptoms. The DC/TMD-SQ collects the essential history for deriving physical (Axis I) TMD diagnoses. It involves 14 items concerning TMJ/masticatory muscle pain, headaches attributed to TMDs, TMJ sounds, and closed as well as opening locking of the TMJs. Just as common TMD conditions are classified into pain-related and intra-articular disorders [26], participants were classified into no/absence of TMDs (AT), pain-related (PT), intra-articular (IT), and combined (CT) TMD groupings, based on the form of TMD symptoms. Positive responses to the principal questions on TMD pain/headaches and TMJ sounds/closed or opening locking were used to identify the absence or presence of painful, intra-articular TMJ, and combined (both PT and IT) TMD symptoms, accordingly.

OHRQoL was assessed with the OHIP-14, which contains 14 items and seven domains. The questions are scored on a 5-point response scale (0 = never to 4 = very often), based on experience in the past month with two items assigned to each domain. The OHIP-14 responses were subsequently examined in three formats, namely severity, extent, and prevalence, as proposed by Slade et al. [30]. Total/domain-OHIP severity-scores were obtained by totaling the ordinal values for all 14 or domain-specific items. Larger severity scores denote

greater impairments to quality of life and poorer OHRQoL. Total/domain extent scores and prevalence were determined by the number of items reported as "fairly often" and "very often" (i.e., FOVO) and the percentage of subjects reporting one or more FOVO responses, respectively.

Statistical analysis

The IBM SPSS Statistics for Windows software Version 24.0 (IBM Corporation, Armonk, NY, USA) was employed for statistical analyses with the significance level set at 0.05. OHIP severity and extent scores were summarized as means (standard deviations) and medians (interquartile ranges), while FOVO prevalence was presented as frequencies with percentages. The Kolmogorov-Smirnov test was applied to confirm the normality of OHIP data. As data were not normally distributed, the Kruskal-Wallis and Mann-Whitney U tests were used to compare severity/extent scores among TMD groups. Differences in FOVO prevalence was assessed with chi-square and pairwise Z tests. Spearman's rho correlation was employed to relate total/domain-OHIP severity scores, extent scores, and prevalence rates. Correlation coefficients (r_s) were afterward stratified as follows: weak (0.1–0.3), moderate (0.4–0.6), or strong (0.7–0.9) [31].

Results

Of the 590 eligible individuals contacted, 89 declined involvement in the study, giving a response rate of 84.9%. The final sample (n = 501) consisted of 75.2% women and 24.8% men, with a mean age of 19.7 ± 1.3 years. Of these, 40.7%, 49.9%, 8.8%, and 0.6% were classified with NT, MT, RT, and ST, respectively, while 39.5%, 26.3%, 12.8%, and 21.4% had AT, PT, IT, and CT symptoms, accordingly. The mean and median OHIP severity and extent scores are presented in Tables 1 and 2, while FOVO prevalence rates are shown in Table 3. Centered on the severity of TMD symptoms, significant differences in total-OHIP were as follows: Severity score: ST, RT > MT > NT; extent score: ST > RT, MT > NT; and prevalence rate: RT > MT > NT. Based upon the form of TMD symptoms, significant differences in total-OHIP were as follows: severity score: CT, PT > IT, AT; extent score: CT, PT > AT and CT > IT; and prevalence rate: CT, PT > AT.

Significant differences in domain severity/extent scores and prevalence varied somewhat between the various groups and are reflected in the post-hoc columns of Tables 1–3. Some OHIP-domain trends established for the severity of TMDs were severity score: ST, RT, MT > NT for all domains except functional limitation and ST, RT > MT for physical pain, psychological discomfort, and disability; extent-score: ST, RT > NT for most domains besides functional limitation, psychological discomfort, and handicap; prevalence rate: ST and/or RT > NT for all domains. OHIP-domain trends based on the form of TMD symptoms were severity score: CT, PT > AT for all domains and CT > IT for all domains except functional limitation; extent score: CT, PT > AT for most domains besides function limitation, social disability, and handicap and CT > IT for physical and psychological disability; prevalence rate: CT, PT > AT for most domains except for functional limitation, social disability, and handicap ($p < 0.001$).

The two domains that were most impaired (highest severity scores) were physical pain and disability for the ST group, psychological discomfort and disability for the RT group, and physical pain and psychological discomfort for the MT group. Likewise, the two domains with the greatest severity scores were physical pain and psychological discomfort for the CT, PT, and IT groups. Although the correlations among OHIP severity scores, extent scores, and prevalence were significant ($p < 0.001$), correlations were mostly weak ($r_s = 0.17$ to 0.34) except between extent-scores and prevalence rates. Correlations for the latter were strong with coefficients (r_s) ranging from 0.96 to 1.00.

Discussion

General overview

This study investigated the associations between the presence of differing severity/form of TMD symptoms and OHRQoL. The biopsychosocial impacts of various TMD symptoms were also compared with three formats of OHRQoL assessment. As the severity/form of TMD symptoms affected OHRQoL, and the three formats of OHIP appraisal led to disparate outcomes, the first and third null hypotheses were rejected. The second null hypothesis was accepted, as some OHIP domains were impaired more than others. Young adults were chosen for the present study, as they represented the majority of TMD patients and the peak age range for occurrence of TMD symptoms [15]. The generic OHIP-14 was selected over a condition-specific OHRQoL measure, like the OHIP-TMDs [32], to facilitate comparison with other oral conditions and findings from earlier TMD work. Mean severity scores were also displayed for the latter reasons. TMD symptoms were common and present in about 60% of the cohort of young adults. Findings agreed with prior system reviews, indicating a high

Table 1. Mean and median OHIP severity scores by severity and form of TMD symptoms.

Severity of TMD symptoms							
OHIP domain		NT n = 204	MT n = 250	RT n = 44	ST n = 3	*p*-value	Post-hoc
Functional limitation	Mean ± SD	0.50 ± 0.95	1.13 ± 1.54	1.80 ± 1.94	1.67 ± 1.53	<0.001	RT, MT > NT
	Median (IQR)	0 (0–1)	0 (0–2)	1 (0–3)	2 (0–2)		
Physical pain	Mean ± SD	1.59 ± 1.56	2.35 ± 1.73	3.07 ± 1.65	7.33 ± 1.15	<0.001	ST, RT > MT > NT
	Median (IQR)	1 (0–2)	2 (1–3.25)	3 (2–4)	8 (6–8)		
Psychological discomfort	Mean ± SD	1.48 ± 1.70	2.40 ± 2.03	3.57 ± 2.40	5.33 ± 1.15	<0.001	ST, RT > MT > NT
	Median (IQR)	1 (0–2.75, 0–8)	2 (1–4)	4 (2–6)	6 (4–6)		
Physical disability	Mean ± SD	1.16 ± 1.42	2.08 ± 1.83	2.77 ± 2.21	6.33 ± 2.08	<0.001	ST, RT, MT > NT
	Median (IQR)	1 (0–2)	2 (0.75–3)	3 (0–5)	7 (4–7)		
Psychological disability	Mean ± SD	1.20 ± 1.54	2.06 ± 1.78	3.30 ± 2.17	5.67 ± 0.58	<0.001	ST, RT > MT > NT
	Median (IQR)	1 (0–2)	2 (0–3)	3.5 (1.25–5)	6 (5–6)		
Social disability	Mean ± SD	0.60 ± 1.22	1.36 ± 1.60	2.25 ± 2.27	5.33 ± 2.52	<0.001	ST, RT, MT > NT
	Median (IQR)	0 (0–1)	1 (0–2)	2 (0–4)	5 (3–5)		
Handicap	Mean ± SD	0.66 ± 1.21	1.43 ± 1.62	2.11 ± 1.81	5.33 ± 2.52	<0.001	ST, RT, MT > NT
	Median (IQR)	0 (0–1)	1 (0–2)	2 (0.25–3)	5 (3–5)		
Total OHIP	Mean ± SD	7.19 ± 7.25	12.81 ± 8.66	18.86 ± 11.78	37 ± 10	<0.001	ST, RT > MT > NT
	Median (IQR)	5 (2–10)	11 (6–18)	19 (9.5–26)	37 (27–37)		
Form of TMD symptoms							
OHIP domain		AT n = 198	PT n = 132	IT n = 64	CT n = 107	*p*-value	Post-hoc
Functional limitation	Mean ± SD	0.66 ± 1.26	1.21 ± 1.50	0.91 ± 1.55	1.12 ± 1.49	<0.001	PT, CT > AT
	Median (IQR)	0 (0–1)	1 (0–2)	0 (0–1)	0 (0–2)		
Physical pain	Mean ± SD	1.70 ± 1.53	2.39 ± 1.75	1.75 ± 1.63	2.84 ± 1.96	<0.001	CT, PT > ATCT > IT
	Median (IQR)	2 (0–3)	2 (1–4)	2 (0–3)	3 (1–4)		
Psychological discomfort	Mean ± SD	1.61 ± 1.81	2.47 ± 2.17	1.78 ± 1.69	2.97 ± 2.16	<0.001	CT, PT > ATCT > IT
	Median (IQR)	1 (0–3)	2 (0–4)	1 (0–3)	3 (1–5)		
Physical disability	Mean ± SD	1.26 ± 1.53	2.20 ± 1.88	1.33 ± 1.49	2.54 ± 2.06	<0.001	CT, PT > IT, AT
	Median (IQR)	1 (0–2)	2 (1–4)	1 (0–2)	2 (1–4)		
Psychological disability	Mean ± SD	1.27 ± 1.55	2.08± 1.89	1.53 ± 1.61	2.76 ± 2.02	<0.001	CT, PT > ATCT > IT
	Median (IQR)	1 (0–2)	2 (0–3)	1 (0–3)	3 (1–4)		
Social disability	Mean ± SD	0.87 ± 1.47	1.42 ± 1.80	0.72 ± 1.23	1.61 ± 1.81	<0.001	CT, PT > IT, AT
	Median (IQR)	0 (0–1)	1 (0–2)	0 (0–1)	1 (0–3)		
Handicap	Mean ± SD	0.92 ± 1.45	1.41 ± 1.65	0.94 ± 1.42	1.62 ± 1.76	<0.001	CT, PT > ATCT > IT
	Median (IQR)	0 (0–1)	1 (0–2)	0 (0–1.75)	1 (0–3)		
Total OHIP	Mean ± SD	8.29 ± 8.09	13.19 ± 8.97	8.95 ± 8.67	15.46 ± 10.38	<0.001	CT, PT > IT, AT
	Median (IQR)	6 (3–11)	11.5 (6–18.75)	6 (2–13.75)	13 (7–23)		

TMD: Temporomandibular disorders; OHIP: Oral health impact profile; NT: no TMDs; M: Mild TMDs; RT: Moderate TMDs; ST: Severe TMDs; PT: Pain-related TMDs; IT: Intra-articular TMDs; CT: Combined TMDs. Results of Kruskal-Wallis and Mann-Whitney U test with Bonferroni correction ($p < 0.05$).

prevalence of TMD signs/symptoms in the general population and highlighted the importance of routine TMD screening in dental practice [20,21].

Severity of TMD symptoms

Total-OHIP severity scores increased with greater TMD severity, and mean scores ranged from 7.19 ± 7.25 to 18.86 ± 11.78 for no to moderate TMDs. Findings paralleled those of a recent study by Fuller et al. [33] that reported mean total OHIP severity scores varying from 5.20 ± 6.62 to 14.89 ± 10.76 for no to moderate-severe periodontal disease. Although the mean total OHIP scores for the severe TMD group was about 5 times that of the no TMD group, its sample size was exceedingly small, as with other research based on the FAI [34]. Findings for the severe TMD group, thus, cannot be extrapolated due to possible latent errors.

While between-group differences in total OHIP severity scores and prevalence were similar (i.e., RT > MT > NT), outcomes for extent-scores varied slightly (i.e., RT, MT > NT). However, findings for domain severity scores, extent scores, and FOVO prevalence fluctuated considerably, revealing different patterns in responses among the TMD severity groupings (Tables 1–3). It is, thus, prudent that OHRQoL data be assessed using all three formats until meaningful OHIP severity benchmarks are established [27], which is all the more important for differentiating the form of TMD symptoms Table 4.

Form of TMD symptoms

Mean total OHIP severity scores varied from 13.19 ± 8.97 to 15.46 ± 10.38 for participants with painful TMD symptoms (i.e., PT/CT groups) and ranged from 8.29 ± 8.09 to 8.95 ± 8.67 for the AT and IT groups. The mean severity scores attained agreed with those reported by Almoznino et al. [35] for muscle and joint pain (13.20 ± 7.85) based on the RDC/TMD. Findings also concurred with the work of Filho et al.

Table 2. Mean and median FOVO extent scores by severity and form of TMD symptoms.

Severity of TMD symptoms							
OHIP domain		NT n = 204	MT n = 250	RT n = 44	ST n = 3	*p*-value	Post-hoc
Functional limitation	Mean ± SD	0.2 ± 0.16	0.10± 0.34	0.27 ± 0.54	0.33 ± 0.58	<0.001	RT > MT > NT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)		
Physical pain	Mean ± SD	0.10 ± 0.36	0.20 ± 0.49	0.32 ± 0.60	2 ± 0	<0.001	ST > RT > NT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0.75)	2 (2–2)		
Psychological discomfort	Mean ± SD	0.17± 0.40	0.36 ± 0.56	0.61 ± 0.72	1 ± 1	<0.001	RT, MT > NT
	Median (IQR)	0 (0–0)	0 (0–1)	0 (0–1)	1 (0–1)		
Physical disability	Mean ± SD	0.05 ± 0.24	0.19 ± 0.51	0.43 ± 0.62	1.67 ± 0.58	<0.001	ST > RT > MT > NT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–1)	2 (1–2)		
Psychological disability	Mean ± SD	0.09 ± 0.31	0.30 ± 0.52	0.57 ± 0.70	1 ± 0	<0.001	ST, RT > MT > NT
	Median (IQR)	0 (0–0)	0 (0–1)	0 (0–1)	1 (1–1)		
Social disability	Mean ± SD	0.04 ± 0.19	0.12 ± 0.36	0.25 ± 0.58	1 ± 1	<0.001	ST > RT > NT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	1 (0–1)		ST > MT
Handicap	Mean ± SD	0.06 ± 0.29	0.16 ± 0.40	0.18 ± 0.45	1.33 ± 0.58	<0.001	ST > MT > NT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	1 (1–1)		ST > RT
Total OHIP	Mean ± SD	0.53 ± 1.31	1.42 ± 1.97	2.64 ± 3.22	8.33 ± 2.31	<0.001	ST > RT, MT > NT
	Median (IQR)	0 (0–0)	0 (0–2)	0 (0–3)	7 (7–7)		
Form of TMD symptoms							
OHIP domain		AT n = 198	PT n = 132	IT n = 64	CT n = 107	*p*-value	Post-hoc
Functional limitation	Mean ± SD	0.06 ± 0.27	0.08 ± 0.30	0.11 ± 0.36	0.14 ± 0.37	0.067	Not applicable
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)		
Physical pain	Mean ± SD	0.09 ± 0.31	0.18 ± 0.48	0.16 ± 0.41	0.37 ± 0.68	<0.001	CT > PT, AT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–1)		
Psychological discomfort	Mean ± SD	0.19 ± 0.43	0.37 ± 0.58	0.25 ± 0.44	0.49 ± 0.66	<0.001	CT, PT > AT
	Median (IQR)	0 (0–0)	0 (0–1)	0 (0–0.75)	0 (0–1)		
Physical disability	Mean ± SD	0.08 ± 0.34	0.22 ± 0.51	0.06 ± 0.24	0.30 ± 0.62	<0.001	CT, PT > AT
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)		CT > IT
Psychological disability	Mean ± SD	0.14 ± 0.36	0.30 ± 0.52	0.11 ± 0.31	0.44 ± 0.63	<0.001	CT, PT > AT
	Median (IQR)	0 (0–0)	0 (0–1)	0 (0–0)	0 (0–1)		CT > IT
Social disability	Mean ± SD	0.06 ± 0.26	0.15 ± 0.44	0.05 ± 0.21	0.15 ± 0.41	0.059	Not applicable
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)		
Handicap	Mean ± SD	0.09 ± 0.32	0.17 ± 0.41	0.08 ± 0.37	0.18 ± 0.43	0.063	Not applicable
	Median (IQR)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)		
Total OHIP	Mean ± SD	0.70 ± 1.54	1.47 ± 2.14	0.81 ± 1.64	2.07 ± 2.64	<0.001	CT, PT > AT
	Median (IQR)	0 (0–1)	0 (0–2)	0 (0–1)	1 (0–3)		CT > IT

TMD: Temporomandibular disorders; OHIP: Oral health impact profile; FOVO: Fairly often and very often; NT: no TMDs; MT: Mild TMDs; RT: Moderate TMDs; ST: Severe TMDs; PT: Pain-related TMDs; IT: Intra-articular TMDs; CT: Combined TMDs. Results of Kruskal-Wallis and Mann-Whitney U test with Bonferroni correction ($p < 0.05$).

Table 3. FOVO prevalence rates by severity and form of TMD symptoms.

Severity of TMD symptoms							
OHIP domain	Total % (n)	NT % (n)	MT % (n)	RT % (n)	ST % (n)	*p*-value	Post-hoc
Functional limitation	7.8 (39)	2.5 (5)	9.2 (23)	22.7 (10)	33.3 (1)	<0.001	RT > NT
Physical pain	14.2 (71)	7.8 (16)	16.4 (41)	25 (11)	100 (3)	<0.001	ST > NT
Psychological discomfort	26.7 (134)	16.2 (33)	31.2 (78)	47.7 (21)	66.7 (2)	<0.001	RT > NT
Physical disability	12.4 (62)	4.4 (9)	13.6 (34)	36.4 (16)	100 (3)	<0.001	RT, ST > NT
Psychological disability	21.6 (108)	8.8 (18)	26.8 (87)	45.5 (20)	100 (3)	<0.001	RT > NT
Social disability	8.8 (44)	3.9 (8)	10.4 (26)	18.2 (8)	66.7 (2)	<0.001	ST > NT
Handicap	11.2 (56)	4.4 (9)	14.8 (37)	15.9 (7)	100 (3)	<0.001	ST, MT > NT
Total OHIP	39.5 (198)	22.1 (45)	48 (120)	68.2 (30)	100 (3)	<0.001	RT > MT > NT
Form of TMD symptoms							
OHIP domain	Total % (n)	AT % (n)	PT % (n)	IT % (n)	CT % (n)	*P*-value	Post-hoc
Functional limitation	7.8 (39)	4.5 (9)	7.6 (10)	9.4 (6)	13.1 (14)	0.063	Not applicable
Physical pain	14.2 (71)	7.6 (15)	14.4 (19)	14.1 (9)	26.2 (28)	<0.001	CT > AT
Psychological discomfort	26.7 (134)	17.2 (34)	31.8 (42)	25 (16)	39.3 (42)	<0.001	CT > AT
Physical disability	12.4 (62)	6.1 (12)	17.4 (23)	6.3 (4)	21.5 (23)	<0.001	CT > AT
Psychological disability	21.6 (108)	13.6 (27)	26.5 (35)	10.9 (7)	36.4 (39)	<0.001	CT > AT
Social disability	8.8 (44)	5.6 (11)	12.1 (16)	4.7 (3)	13.1 (14)	0.042	Not applicable
Handicap	11.2 (56)	8.1 (16)	15.2 (20)	4.7 (3)	15.9 (17)	0.028	Not applicable
Total OHIP	39.5 (198)	26.3 (52)	48.5 (64)	35.9 (23)	55.1 (59)	<0.001	CT, PT > AT

TMD: Temporomandibular disorders; OHIP: Oral health impact profile; FOVO: Fairly often and very often; NT: no TMDs; M: Mild TMDs; RT: Moderate TMDs; ST: Severe TMDs; PT: Pain-related TMDs; IT: Intra-articular TMDs, CT: Combined TMDs. Results of chi-square and pair-wise Z tests ($p < 0.05$).

Table 4. Correlation among the severity scores, extent scores, and prevalence rates (n = 501).

OHIP domain	Severity & extent-scores	Severity score & prevalence	Extent score & prevalence
Functional limitation	0.21	0.20	1.00
Physical pain	0.18	0.18	1.00
Psychological discomfort	0.23	0.22	0.99
Physical disability	0.27	0.27	1.00
Psychological disability	0.30	0.29	1.00
Social disability	0.17	017	1.00
Handicap	0.19	0.19	1.00
Total OHIP	0.34	0.32	0.96

OHIP: Oral health impact profile, Spearman's rho correlation. All p-values <0.001.

[17] that indicated women with total OHIP scores >14 were at greater risk of experiencing TMD symptoms. Participants with painful TMDs had significantly higher total OHIP severity/extent scores and FOVO prevalence than those with no TMD symptoms (CT, PT > AT). Additionally, the non-painful IT group had significantly lower total OHIP severity scores than CT/PT groups and lower extent scores than the CT group. These findings paralleled those conducted on clinical samples and may be explained by possible functional, physical, and psychosocial impairments associated with TMD pain [9,10].

Outcomes for between-group comparisons of OHIP domains were again dependent on the OHIP appraisal format applied. While significant differences in severity scores were noted for all domains, extent scores and FOVO prevalence were only statistically significant for the physical pain, physical disability, psychological discomfort, and psychological disability domains. Findings further substantiated the necessity for OHIP data to be assessed in different formats besides severity and validated the work of Yap et al. [36], based on the OHIP-TMDs.

These authors concluded that TMDs impacted the physical and psychosocial well-being of young adults and advocated the appraisal of OHRQoL by severity as well as extent, and/or prevalence.

Impacts and correlations

For both severity and form of TMD symptoms, the most compromised OHIP domains were physical pain/disability and psychological discomfort/disability. The same observations were also reported for TMD patients [35]. Results validated the belief that physical and psychological "ailments" caused by TMDs lower quality of life [10]. Collectively, the findings underscore the importance of addressing any associated psychological difficulties/conditions when managing physical pain in TMD patients. This may include counseling, stress management, psychotherapy, as well as positive psychology interventions like mindfulness meditation [37]. The functional limitation, social disability, and handicap domains were not markedly impaired even in TMD patients [35]. Functional limitations, in particular, were found to be influenced more by pain intensity than pain chronicity and intra-articular disorders [38]. Findings supported the utility of OHIP-14 for identifying clinical problems and prioritizing care as well as treatment outcomes.

Besides extent scores and prevalence, correlations among the three formats of OHIP appraisal were generally weak. However, the associations between FOVO extent scores and prevalence rates were strong, with almost perfect correlations for total OHIP (r_s = 0.96) and the different OHIP domains (r_s = 0.99–1.00). Correlation coefficients were comparable to those obtained for the OHIP-TMDs, which was specifically designed to draw on TMD symptoms and has greater sensitivity, specificity, and responsiveness, as well as lower "floor effects" (i.e., no impact) [32]. For scientific reporting purposes, FOVO prevalence is preferred over extent scores, as it is simpler to analyze and interpret. Nonetheless, severity scores should still be maintained as the key descriptive reporting benchmark, given its widespread use and ease of understanding/comparison.

Study limitations

There were several limitations associated with the study design and data collected. First, the study involved only young adults and not mature ones, who might have a higher frequency of TMD pain and lower OHRQoL in the physical pain domain [19]. Furthermore, the young adults recruited were studying in higher education and may experience more academic stressors and psychological distress [39]. Second, the TMD symptoms were self-reported, and no clinical or radiographic examinations were performed to verify the TMD features. Responses may be subject to various biases arising from sampling approach, social desirability, selective recall, as well as recall periods [39]. To minimize possible convenience sampling and non-response biases, multiple samples were randomly recruited from different schools, and a high response rate was achieved. Third, other oral conditions, such as dental caries, periodontal disease, and wisdom tooth problems, as well as TMD pain intensity and chronicity that could affect OHRQoL, were not accounted for. Therefore, further studies could incorporate older and non-schooling

community samples, physical examinations, as well as the collection of data on other dental conditions and TMD characteristics.

Conclusion

This study indicated that TMD symptoms were present in about three-fifths of the cohort of young adults and provided further support for the high prevalence of TMDs in the general population. Efforts should, thus, be made to screen all patients for TMDs in dental practice, especially since TMDs have been reported to negatively impact patients' quality of life. OHRQoL outcomes were found to be influenced by the severity and form of TMD symptoms as well as formats of OHIP appraisal. More severe and painful TMD symptoms were associated with greater impairments in quality of life, especially in the physical and psychological domains. The functional limitation, social, and handicap domains appeared to be less affected. OHIP data should ideally be examined in different formats, preferably severity and extent or prevalence, given the strong correlations between the latter methods. Clinically, the OHIP-14 may be useful for identifying problems and prioritizing care/treatment outcomes from the patients' perspective.

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Data availability statement

Data for this study are available from the corresponding author upon reasonable request.

Disclosure statement

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References

[1] Rozier RG, Pahel BT. Patient- and population-reported outcomes in public health dentistry: oral health-related quality of life. Dent Clin North Am. 2008;52(2):345–365.
[2] Sischo L, Broder HL. Oral health-related quality of life: what, why, how, and future implications. J Dent Res. 2011;90(11):1264–1270.
[3] Bennadi D, Reddy CV. Oral health related quality of life. J Int Soc Prev Community Dent. 2013;3(1):1–6.
[4] Slade GD, Spencer AJ. Development and evaluation of the oral health impact profile. Community Dent Health. 1994;11(1):3–11.
[5] Slade GD. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol. 1997;25(4):284–290.
[6] Locker D. Measuring oral health: a conceptual framework. Community Dent Health. 1988;5(1):3–18.
[7] Wong LB, Yap AU, Allen PF. Periodontal disease and quality of life: umbrella review of systematic reviews. J Periodontal Res. 2021;56(1):1–17.
[8] Andiappan M, Gao W, Bernabé E, et al. Malocclusion, orthodontic treatment, and the oral health impact profile (OHIP-14): systematic review and meta-analysis. Angle Orthod. 2015;85(3):493–500. DOI:10.2319/051414-348.1.
[9] Dahlström L, Carlsson GE. Temporomandibular disorders and oral health-related quality of life. A systematic review. Acta Odontol Scand. 2010;68(2):80–85. DOI:10.3109/00016350903431118.
[10] Bitiniene D, Zamaliauskiene R, Kubilius R, et al. Quality of life in patients with temporomandibular disorders. A systematic review. Stomatologija 2018;20(1):3–9.
[11] List T, Jensen RH. Temporomandibular disorders: old ideas and new concepts. Cephalalgia. 2017;37(7):692–704.
[12] Bueno CH, Pereira DD, Pattussi MP, et al. Gender differences in temporomandibular disorders in adult populational studies: a systematic review and meta-analysis. J Oral Rehabil. 2018;45(9):720–729. DOI: 10.1111/joor.12661.
[13] Slade GD, Fillingim RB, Sanders AE, et al. Summary of findings from the OPPERA prospective cohort study of incidence of first-onset temporomandibular disorder: implications and future directions. J Pain. 2013;14(12 Suppl):T116–124. DOI: 10.1016/j.jpain.2013.09.010.
[14] De La Torre Canales G, Câmara-Souza MB, Muñoz Lora VRM, et al. Prevalence of psychosocial impairment in temporomandibular disorder patients: a systematic review. J Oral Rehabil. 2018;45(11):881–889. DOI: 10.1111/joor.12685.
[15] Yap AU, Cao Y, Zhang MJ, et al. Age-related differences in diagnostic categories, psychological states and oral health-related quality of life of adult temporomandibular disorder patients. J Oral Rehabil. 2021. Epub ahead of print.
[16] Foger D, Peralta-Mamani M, Santos Paulo S. Impact of temporomandibular disorders on quality of life. Fisioter Mov. 2020;33: e003320. DOI: 10.1590/1980-5918.033.ao20.

[17] Filho JC, Vedovello SAS, Venezian GC, et al. Women's oral health-related quality of life as a risk factor for TMD symptoms. A case-control study. CRANIO®. 2020;1–5. Epub ahead of print. DOI:10.1080/08869634.2020.1833159.
[18] Yamane-Takeuchi M, Ekuni D, Mizutani S, et al. Associations among oral health-related quality of life, subjective symptoms, clinical status, and self-rated oral health in Japanese university students: a cross-sectional study. BMC Oral Health. 2016 30;16(1):127. DOI:10.1186/s12903-016-0322-9.
[19] Gillborg S, Åkerman S, Lundegren N, et al. Temporomandibular disorder pain and related factors in an adult population: a cross-sectional study in Southern Sweden. J Oral Facial Pain Headache. 2017;31(1):37–45. DOI:10.11607/ofph.1517.
[20] Joseph R, Rahena A, Hassan N. et al. Epidemiology of temporomandibular disorder in the general population: a systematic review. Adv Dent Oral Health. 2019;10(3):555787.
[21] Lai YC, Yap AU, Türp JC. Prevalence of temporomandibular disorders in patients seeking orthodontic treatment: a systematic review. J Oral Rehabil. 2020;47(2):270–280.
[22] Adèrn B, Minston A, Nohlert E, et al. Self-reportance of temporomandibular disorders in adult patients attending general dental practice in Sweden from 2011 to 2013. Acta Odontol Scand. 2018;76(7):530–534. DOI:10.1080/00016357.2018.1487076.
[23] Tsakos G, Allen PF, Steele JG, et al. Interpreting oral health-related quality of life data. Community Dent Oral Epidemiol. 2012;40(3):193–200. DOI:10.1111/j.1600-0528.2011.00651.x.
[24] Faul F, Erdfelder E, Lang AG, et al. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods. 2007;39:175–191.
[25] Fonseca DM, Bonfante G, Valle AL. et al. Diagnosis by anamnesis of craniomandibular dysfunction [Diagnóstico pela anamneses da disfunção craniomandibular]. Rev Gaúcha Odontol. 1994;42(1):23–32.
[26] Schiffman E, Ohrbach R, Truelove E, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: recommendations of the International RDC/TMD consortium network and orofacial pain special interest group. J Oral Facial Pain Headache. 2014;28:6–27.
[27] The international network for orofacial pain and related methodology (INfORM) [homepage], diagnostic criteria for temporomandibular disorders symptom questionnaire. [cited 2019 Jun 15]. Available from: https://ubwp.buffalo.edu/rdc-tmdinternational/tmd-assessmentdiagnosis/dc-tmd/.
[28] Campos JA, Carrascosa AC, Bonafé FS, et al. Severity of temporomandibular disorders in women: validity and reliability of the Fonseca Anamnestic Index. Braz Oral Res. 2014;28:16–21.
[29] Zhang MJ, Yap AU, Lei J, et al. Psychometric evaluation of the Chinese version of the Fonseca anamnestic index for temporomandibular disorders. J Oral Rehabil. 2020;47(3):313–318. DOI: 10.1111/joor.12893.
[30] Slade GD, Nuttall N, Sanders AE, et al. Impacts of oral disorders in the United Kingdom and Australia. Br Dent J. 2005;198(8):489–493. DOI: 10.1038/sj.bdj.4812252.
[31] Dancey CP, Reidy J. Statistics without maths for psychology. 7th ed. London: Pearson; 2017.
[32] Durham J, Steele JG, Wassell RW, et al. Creating a patient-based condition-specific outcome measure for temporomandibular disorders (TMDs): oral health impact profile for TMDs (OHIP-TMDs). J Oral Rehabil. 2011;38(12):871–883. DOI: 10.1111/j.1365-2842.2011.02233.x.
[33] Fuller J, Donos N, Suvan J, et al. Association of oral health-related quality of life measures with aggressive and chronic periodontitis. J Periodontal Res. 2020;55(4):574–580. DOI: 10.1111/jre.12745.
[34] Habib SR, Al Rifaiy MQ, Awan KH, et al. Prevalence and severity of temporomandibular disorders among university students in Riyadh. Saudi Dent J. 2015;27(3):125–130. DOI: 10.1016/j.sdentj.2014.11.009.
[35] Almoznino G, Zini A, Zakuto A, et al. Oral health-related quality of life in patients with temporomandibular disorders. J Oral Facial Pain Headache. 2015;29(3):231–241. DOI: 10.11607/ofph.1413.
[36] Yap AU, Qiu LY, Natu VP, et al. Functional, physical and psychosocial impact of temporomandibular disorders in adolescents and young adults. Med Oral Patol Oral Cir Bucal. 2020;25(2):e188–194. DOI: 10.4317/medoral.23298.
[37] Hilton L, Hempel S, Ewing BA, et al. Mindfulness meditation for chronic pain: systematic review and meta-analysis. Ann Behav Med. 2017;51(2):199–213. DOI: 10.1007/s12160-016-9844-2.
[38] Fetai A, Dedic B, Lajnert V, et al. To what extent are the characteristics of painful temporomandibular disorders predictors of self-reported limitations in jaw function? CRANIO®. 2021. Epub ahead of print. DOI: 10.1080/08869634.2020.1853309.
[39] Althubaiti A. Information bias in health research: definition, pitfalls, and adjustment methods. J Multidiscip Healthc. 2016 4;9:211–217. DOI: 10.2147/JMDH.S104807.

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