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ORIGINAL ARTICLE

Functional, physical and psychosocial impact of degenerative temporomandibular joint disease

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Abstract

Objectives: This study evaluated the functional, physical and psychosocial impacts of TMJ degenerative joint disease (DJD). The bearing of TMJ osteoarthrosis/osteoarthritis and early/late TMJ DJD on oral health-related quality of life (OHRQoL) were also compared.

Methods: Participants were enrolled from a TMD/oro-facial pain centre. Those diagnosed with intra-articular conditions based on the Diagnostic Criteria for Temporomandibular disorders (DC/TMD) were subjected to CBCT assessment and categorised into four discrete groups: NN—no TMJ DJD and no arthralgia; NA—no TMJ DJD with arthralgia; TO—TMJ osteoarthrosis; and TR—TMJ osteoarthritis. The TO/TR groups were subdivided into early/late TMJ osteoarthrosis (EO/LO) and osteoarthritis (ER/LR). OHRQoL was examined using the OHIP-TMD, and data were appraised with the Kruskal-Wallis/Mann-Whitney *U* tests ($\alpha = 0.05$).

Results: The study participant ($n = 358$) had a mean age of 31.85 ± 12.39 years (85.6% women). Frequencies of the TMD groups were as follows: NN—23.2%; NA—27.1%; TO—19.0%; and TR—30.7%. Participants with TR/NA had significantly worse OHRQoL than those with TO/NN. Additionally, participants with ER/LR reported significantly poorer OHRQoL than their counterparts with EO/LO. For all TMD groups and TMJ DJD subgroups, the psychological discomfort domain was generally the most impaired. Differences in global OHIP scores were significant between participants with and without arthralgia (i.e., NA-NN, ER-EO and LR-LO).

Conclusions: The presence of TMJ pain appeared to impair OHRQoL more than the severity of TMJ DJD. As psychological domains were most impacted, psychosocial care should be incorporated when managing patients with painful TMJ DJD.

KEYWORDS
degenerative joint disease, oral health, pain, quality of life, temporomandibular disorders

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1 | BACKGROUND

Temporomandibular disorders (TMDs) are a group of musculoskeletal conditions characterised by pain and dysfunction of the masticatory musculature, temporomandibular joints (TMJs) and related anatomical structures.[1] Based on the contemporary Diagnostic Criteria for TMDs (DC/TMD) standard, they can be classified into pain-related and/or intra-articular (TMJ) disorders.[2] TMJ disc displacements (DDs) and degenerative joint disease (DJD) are the most common types of intra-articular TMDs affecting 19.1% and 9.8% of adults in the general population respectively.[3] The prevalence of TMJ DJD is even higher among TMD patients and ranges from 18.0% to 84.7%.[4] TMJ DJD is typified by progressive articular tissue deterioration with concomitant osseous re-modelling of the condyle and/or articular eminence.[2] They can be further categorised into TMJ osteoarthrosis (DJD without arthralgia [TMJ pain]) and osteoarthritis (DJD with arthralgia).[2] TMJ DJD if unchecked can lead to condylar form/structure abnormalities ensuing in dentofacial deformities, occlusal derangements and functional disabilities.[5] The pathogenesis of TMJ DJD is multifaceted, and risk factors include age, genetics, TMJ disc displacements (DD), trauma, functional overload and systemic/developmental conditions.[6]

According to the DC/TMD, TMJ DJD is present when there is a history/self-report of TMJ noises with jaw movement/function and TMJ crepitus on palpation during jaw opening, closing, lateral or protrusive movements. TMJ computed tomography (CT) is recommended if the diagnosis needs to be confirmed.[2] In their systematic review, Hilgenberg-Sydney et al. evaluated the diagnostic validity of CT and cone-beam CT (CBCT) for assessing TMJ DJD in relation to Research Diagnostic Criteria for TMDs (RDC/TMD) and DC/TMD examination protocols.[7] Findings were equivocal with some studies indicating high sensitivity/specificity and others reporting otherwise, reflecting the lack of standardised benchmarks for reviewing TMJ images.[8]

Oral health-related quality of life (OHRQoL) is a complex construct concerning the subjective evaluation of an individual's oral health, physical/psychosocial wellness, care satisfaction and self-worth.[9] OHRQoL measures can be generic or condition-specific with the latter offering higher specificity, sensitivity, responsiveness and lower 'floor effects' as items are targeted at more relevant and prevalent effects/symptoms.[9,10] The Oral Health Impact Profile for TMDs (OHIP-TMD) was developed to address the absence of a TMD-specific OHRQoL instrument.[11] It has good psychometric properties[12,13] and had been utilised in both clinical and non-clinical populations.[14,15]

Although TMDs are known to impair quality of life,[16,17] earlier studies were based largely on generic OHRQoL measures. Additionally, information about the impact of TMJ DJD on OHRQoL is still scarce and had not been examined in depth.[18,19] Hence, the objectives of this study were to examine the functional, physical and psychosocial impacts of TMJ DJD. The bearing of TMJ osteoarthrosis and osteoarthritis and early and late TMJ DJD on OHRQoL were also compared. The null hypotheses were as follows: (a) TMJ DJD has no functional, physical and psychosocial influence on OHRQoL, and (b) no significant differences in OHRQoL exist between individuals with TMJ osteoarthrosis/osteoarthritis and early/late TMJ DJD.

2 | METHODS

2.1 | Study population and TMD assessment

This study is part of project PKUSS-201732009, which was endorsed by the Ethics Committee of the Peking University Hospital/School of Stomatology. Adult patients (≥18 years old) seeking treatment at a TMD/oro-facial centre were screened for eligibility and recruited. A minimum sample size of $n = 344$ was calculated a priori with the G*Power software version 3.1.9.3 using the Wilcoxon-Mann-Whitney model, 0.50 effect size, 0.05 alpha error, 95% power and projected allocation ratio (ratio of numbers of participants in each comparison TMJ groups) of four.[20] The inclusion criteria comprised the reporting of pain and/or function-related TMD symptoms and the presence of DC/TMD-defined intra-articular disorders. Patients with prior TMJ trauma, tumour, arthritis secondary to systematic diseases and masticatory muscle disorders/pain were excluded together with those suffering from debilitating metabolic, autoimmune and psychiatric problems. In addition, illiterate/intellectually impaired patients and those who had consumed central nervous system agents in the previous 2 weeks were also omitted. Study participation was voluntary with no incentives offered, and informed consent form was provided by all eligible patients. At their initial visit, participants were asked to complete a comprehensive survey including demographic information, medical/dental history, the DC/TMD Symptoms Questionnaire and the OHIP-TMD. The participants were then examined by a single TMD specialist who was trained, calibrated and proficient in the DC/TMD methodology. TMD diagnoses were then rendered based on TMD symptom history, findings of physical assessment and the DC/TMD diagnostic algorithms. Participants with DC/TMD-defined intra-articular disorders, specifically TMJ DD and/or DJD, were subsequently subjected to CBCT examination.

2.2 | Cone-beam CT assessment of TMJs

Cone-beam CT examination was performed to confirm the presence or absence of TMJ DJD. Images of the bilateral TMJs were acquired with a three-dimensional CBCT scanner (3D Accuitomo 170, J. Morita Corporation, Kyoto, Japan) at 76–80 kV and 4.2–6.0 mA using either a 4 × 4 or 6 × 6 cm field of view. CBCT data were reconstructed, and axial, coronal and sagittal images of the TMJs were attained at 1.0-mm slice intervals. Degenerative changes of the TMJs where present were grouped into six categories as follows: Type I—loss of articular cortex continuity; Type II—surface erosion/destruction; Type III—deviation in form; Type IV—sclerosis; Type V—osteophyte formation; and Type VI—cyst-like lesion.[21,22] Types I and

II are regarded early alterations, while types III to VI are considered late changes.[21,22] The appraisal of CBCT images and documentation of early/late degenerative changes of the more affected joint were done by two assessors that had an inter-rater kappa value of 0.79. Any disagreements were resolved by consulting a third assessor who was a senior radiologist. The participants were eventually organised into four discrete groups, namely (i) no TMJ DJD and no arthralgia (NN), (ii) no TMJ DJD with arthralgia (NA), (iii) TMJ DJD and no arthralgia, that is TMJ osteoarthrosis (TO), and (iv) TMJ DJD with arthralgia, that is TMJ osteoarthritis (TR). The TO and TR groups were further divided into early/late TMJ osteoarthrosis (EO/LO) and osteoarthritis (ER/LR). All participants had a history of current or past TMJ disc displacements.

2.3 | OHRQoL assessment

The TMD-specific OHIP-TMD was used to evaluate OHRQoL. The 22-item measure contains seven domains (i.e., functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap) and is scored on a 5-point rating scale extending from 0 = never to 4 = very often. Points for all 22 and assigned domain items are added together to derive the total and domain OHIP scores respectively. Higher OHIP scores denote a poorer or worse quality of life.

2.4 | Statistical analyses

All statistical enquiries were carried out with the SPSS statistical software Version 26.0 (IBM Corporation) with a significance level of 0.05. Data distribution was checked with the Shapiro-Wilk test. Categorical data were summarised as frequencies (with percentages) and explored using Chi-squared and Z-tests. Continuous data were described as means/medians (with standard deviations/interquartile ranges) and examined with the Kruskal-Wallis and Mann-Whitney *U* tests as they were not distributed normally.

3 | RESULTS

A total of 549 patients were assessed for eligibility of which 191 met the exclusion criteria. The remaining 358 patients that had a mean age of 31.85 ± 12.39 years (85.6% women) consented to study participation (Figure 1). Table 1 shows the distribution of the study sample by TMD diagnoses. Frequencies of the four TMD groups were as follows: NN—23.2%; NA—27.1%; TO—19.0%; and TR—30.7%. The TR group was significantly older and comprised a higher proportion of women like the other groups. Disease duration at presentation for non-painful conditions (i.e., TO and NN) was significantly greater than painful ones (i.e., TR and NA).

Table 2 indicates the mean/median global and domain OHIP scores for the four TMD groups. Participants with TR and NA had significantly greater global OHIP scores than those with TO and NN. However, no significant differences in global OHIP scores were apparent between TR-NA and TO-NN. A similar trend was observed for the functional limitation, physical pain and physical disability domains. Concerning the psychological disability, social disability and handicap domains, significant differences in scores were noted only between TR/NA and TO. Variations in psychological discomfort scores were insignificant among the TMD groups. For all groups, the psychological discomfort domain was the most impaired. The psychological disability domain was the next most affected with exception of the TR group where the physical pain domain was the second most impaired.

Table 3 reflects the mean/median global and domain OHIP scores for the various TMJ DJD subgroups. ER, LR, EO and LO were present in 32.6%, 29.2%. 9.6% and 28.6% of the participants with TMJ DJD (n = 178) respectively (Figure 1). Those with ER and LR reported significantly worse OHRQoL than their counterparts with EO and LO. Significant differences in domain scores varied somewhat with the LR and/or ER subgroups having mostly higher scores than those with LO and/or EO. Nonetheless, scores for the psychological discomfort domain were again insignificant. The psychological discomfort domain was the most impaired for all TMJ DJD subgroups.

Table 4 presents the findings of pair-wise comparisons between the various TMJ DJD subgroups with NA-NN included for contrast. Differences in global OHIP scores were significant between participants with and without TMJ pain (i.e., NA-NN, ER-EO and LR-LO) regardless of the severity of degenerative changes. Global OHIP scores were insignificant between early and late TMJ osteoarthrosis and osteoarthritis (i.e., EO-LO and ER-LR). When NA-NN were compared, significant differences in functional limitation, physical pain and physical disability domain scores were detected. A significant difference in functional limitation scores was discerned for EO-LO, but no significant differences in domain scores were noted for ER-LR. Though significant differences in almost all domain scores (except psychological discomfort) were observed for LR-LO, scores between ER-EO were insignificant for all domains.

4 | DISCUSSION

This study is one of a few that investigated the functional, physical and psychosocial impacts of TMJ DJD. To the authors' knowledge, it is the first to compare the effect of TMJ osteoarthrosis/osteoarthritis and early/late TMJ DJD on OHRQoL using a TMD-specific measure. As TMJ DJD, particularly TMJ osteoarthritis, affected the various OHIP domains and significant differences in OHRQoL were observed between individuals with TR and TO as well as among the TMJ DJD subgroups, the two null hypotheses were rejected. The patients were inspected for intra-articular TMDs using the DC/TMD protocol before CBCT examination to minimise unnecessary radiation exposure in participants with healthy TMJs.[8] Even though TMJ DD and DJD appear to be strongly related, they may also represent mutually independent conditions. In a recent systematic review, the

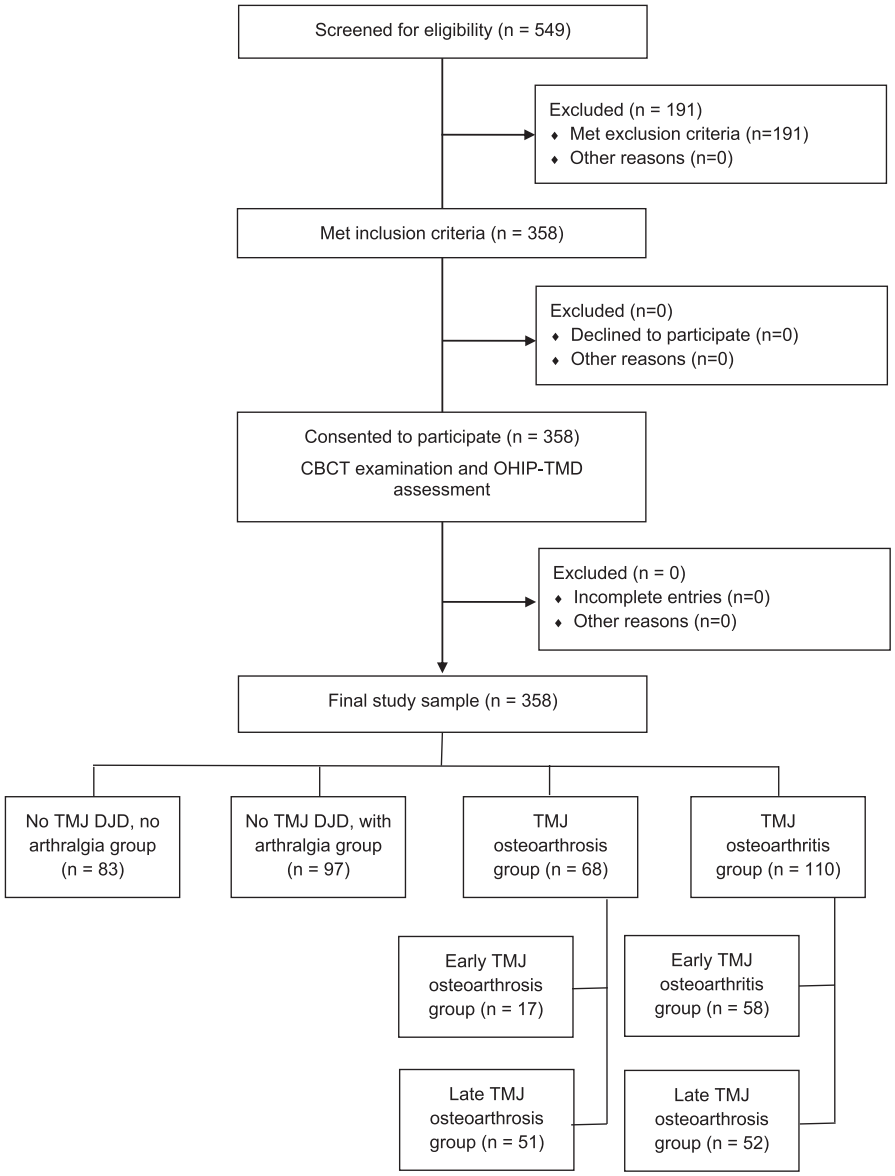

FIGURE 1 Flow diagram detailing the recruitment of participants

prevalence of TMJ DJD involving DD with reduction (DDwR) and DD without reduction (DDw/oR) was 35% and 66% respectively.[23] Although the TR group was significantly older than the rest, they did not involve old adults ≥65 years. Joint pain associated with TMJ DJD is mediated by alterations in both joint environment and peripheral/central neural circuitry that occur over time.[24] Participants with TMJ DJD were mostly women as with earlier prevalence studies.[23] The significantly longer disease duration observed with the TO and NN groups could be explained by delayed treatment seeking due to the absence of TMJ pain.

4.1 | Comparison of TMD groups

When comparing the four TMD groups, participants with painful conditions (i.e., TR and NA) reported significantly worse global OHRQoL than those with non-painful ones (i.e., TO and NN). The functional limitation, physical pain and physical disability domains exhibited identical trends. Findings were in agreement with prior studies demonstrating the considerable influence of pain on OHRQoL in TMD patients.[17]

Furthermore, Ohlmann et al. found that TMJ pain was not associated with MRI-depicted anatomical changes like joint effusions, TMJ DD and DJD but significantly correlated with masticatory muscle pain and psychological factors.[25] It was thus prudent that patients with muscle disorders/pain be excluded from the study. No significant differences in psychological discomfort were discerned, and the psychological domains were most impacted for all TMD groups. This substantiated the role of psychosocial factors in the aetiology of TMDs including intra-articular conditions.

4.2 | Comparison of TMJ DJD subgroups

Participants with painful TMJ DJD (i.e., ER and LR) also had significantly worse global OHRQoL than those with non-painful TMJ

TABLE 1 Distribution of the study sample by TMD diagnoses

Demographics	No TMJ DJD, no arthralgia (NN)	No TMJ DJD, with arthralgia (NA)	TMJ osteoarthrosis (TO)	TMJ osteoarthritis (TR)	*p*-value Post hoc
n(%)	83 (23.2)	97 (27.1)	68 (19.0)	110 (30.7)	Not applicable
Age					
Mean ± SD	29.45 ± 9.46	30.41 ± 11.87	29.79 ± 11.24	36.19 ± 14.34	.001* TR>NN,NA,TO
Median (IQR)	27.00 (12.00)	27.00 (13.00)	26.00 (11.75)	31.00 (24.25)	
Gender					
Women *n*(%)	68 (81.9)	81 (83.5)	57 (83.8)	101(91.8)	.178#
Men *n*(%)	15 (18.1)	16 (16.5)	11 (16.2)	9 (8.2)	
Duration (months)					
Mean ± SD	29.70 ± 38.68	8.52 ± 18.73	26.06 ± 39.35	10.56 ± 17.57	<.001* NN,TO>TR>NA
Median (IQR)	12.00 (40.00)	2.00 (5.00)	12.00 (33.50)	6.00 (9.13)	

Note: Results of Kruskal-Wallis/Mann-Whitney *U* tests* and Chi-square/Z-tests#. > indicates significant differences between groups ($p < ,05$).

TABLE 2 Mean/median global and domain OHIP-TMD scores for the various TMD groups

Variables	No TMJ DJD, no arthralgia (NN)	No TMJ DJD, with arthralgia (NA)	TMJ osteoarthrosis (TO)	TMJ osteoarthritis (TR)	*p*-value Post hoc
Global OHIP					
Mean ± SD	35.93 ± 18.00	43.72 ± 15.04	31.79 ± 17.11	45.28 ± 16.20	<.001* TR,NA>TO,NN
Median (IQR)	38.00 (29.00)	43.00 (21.50)	31.50 (21.75)	45.00 (23.00)	
Functional limitation					
Mean ± SD	4.70 ± 2.01	6.23 ± 1.79	3.51 ± 2.42	5.96 ± 1.94	<.001* NA,TR>NN,TO
Median (IQR)	5.00 (3.00)	7.00 (3.00)	3.00 (4.00)	6.00 (4.00)	
Physical pain					
Mean ± SD	5.70 ± 3.85	8.00 ± 3.45	5.83 ± 4.26	9.62 ± 3.96	<.001* TR,NA>NN,TO
Median (IQR)	6.00 (6.00)	8.00 (5.50)	5.50 (6.75)	9.00 (5.00)	
Psychological discomfort					
Mean ± SD	9.19 ± 4.64	10.15 ± 4.00	8.72 ± 4.32	10.25 ± 3.63	.081
Median (IQR)	9.00 (8.00)	11.00 (6.00)	9.00 (6.00)	11.00 (5.00)	
Physical disability					
Mean ± SD	3.33 ± 2.02	4.58 ± 2.00	3.13 ± 1.94	4.26 ± 1.92	<.001* NA,TR>NN,TO
Median (IQR)	3.50 (3.00)	4.50 (3.00)	3.00 (2.00)	4.00 (2.00)	
Psychological disability					
Mean ± SD	7.80 ± 5.62	8.79 ± 4.77	6.60 ± 4.45	8.93 ± 4.94	.014* NA,TR>TO
Median (IQR)	9.00 (11.00)	9.00 (6.75)	6.50 (7.50)	8.00 (5.00)	
Social disability					
Mean ± SD	2.02 ± 2.05	2.25 ± 1.90	1.50 ± 1.85	2.27 ± 2.07	.028* NA,TR>TO
Median (IQR)	2.00 (4.00)	2.00 (3.00)	1.00 (2.00)	2.00 (4.00)	
Handicap					
Mean ± SD	3.19 ± 2.41	3.72 ± 2.19	2.49 ± 2.25	3.98 ± 2.36	<.001* NA,TR>TO
Median (IQR)	3.00 (4.00)	4.00 (3.00)	2.00 (3.75)	4.00 (4.00)	

Note: Results of Kruskal-Wallis/Mann-Whitney *U* tests. * indicates $p < .05$ and >indicates significant differences between groups.

DJD (i.e., EO and LO). Similar tendencies were also observed for all domains except for psychological discomfort. This corroborated the work of Su et al. who reported that facial pain was strongly and inversely correlated with OHRQoL in patients with TMJ DJD.[19] Moreover, in their long-term CBCT study, Song et al. showed that TO (i.e., EO or LO) had better prognosis than TR (i.e., ER or LR), which is often accompanied by further subchondral bone destruction.[26] The latter if advanced can lead to changes in oral function and oro-facial appearance that deteriorate OHRQoL. Nonetheless, TMJ re-modelling usually progresses gradually with periods of activity

TABLE 3 Mean/median global and domain OHIP-TMD scores for the various TMJ DJD subgroups

Variables	Early TMJ osteoarthritis (ER)	Late TMJ osteoarthritis (LR)	Early TMJ osteoarthrosis (EO)	Late TMJ osteoarthrosis (LO)	*p*-value Post hoc
Global OHIP					
Mean ± SD	43.50 ± 16.08	46.77 ± 16.06	34.11 ± 15.17	31.02 ± 17.79	<.001* LR,ER>EO,LO
Median (IQR)	44.00 (23.25)	44.00 (23.75)	34.00 (18.50)	31.00 (22.00)	
Functional limitation					
Mean ± SD	7.00 (4.00)	6.00 (4.00)	6.00 (4.50)	3.00 (4.00)	<.001* ER,LR,EO>LO
Median (IQR)	6.12 ± 2.00	5.79 ± 1.89	5.05 ± 2.51	3.00 ± 2.19	
Physical pain					
Mean ± SD	9.26 ± 3.93	9.92 ± 3.96	7.24 ± 4.02	5.37 ± 4.28	<.001* LR,ER>LO
Median (IQR)	9.00 (5.00)	10.00 (6.00)	6.00 (5.50)	5.00 (8.00)	
Psychological discomfort					
Mean ± SD	9.83 ± 3.74	10.61 ± 3.43	8.29 ± 3.65	8.86 ± 4.54	.083
Median (IQR)	10.00 (5.25)	11.00 (5.00)	7.00 (5.50)	10.00 (6.00)	
Physical disability					
Mean ± SD	4.34 ± 1.89	4.17 ± 1.98	3.41 ± 1.42	3.04 ± 2.09	.005* ER,LR>LO
Median (IQR)	4.00 (3.00)	4.00 (2.00)	3.00 (1.00)	3.00 (2.00)	
Psychological disability					
Mean ± SD	8.29 ± 5.22	9.48 ± 4.49	6.47 ± 4.30	6.64 ± 4.53	.014* LR>LO,EO
Median (IQR)	7.00 (7.25)	9.00 (6.75)	5.00 (7.50)	7.00 (7.00)	
Social disability					
Mean ± SD	1.97 ± 1.98	2.56 ± 2.10	1.12 ± 1.50	1.62 ± 1.96	.024* LR>LO,EO
Median (IQR)	2.00 (4.00)	2.00 (3.00)	0.00 (2.50)	1.00 (2.00)	
Handicap					
Mean ± SD	3.69 ± 2.37	4.23 ± 2.30	2.53 ± 2.15	2.47 ± 2.30	<.001* LR,ER>LO LR>EO
Median (IQR)	3.50 (3.00)	4.00 (3.75)	2.00 (3.50)	2.00 (4.00)	

Note: Results of Kruskal-Wallis/Mann-Whitney *U* tests. * indicates $p < .05$ and >indicates significant differences between groups.

TABLE 4 Results of pair-wise comparisons between the various TMJ DJD subgroups (*p*-values)

Variables	NA-NN	EO-LO	ER-LR	ER-EO	LR-LO
Global OHIP	0.004*	NS	NS	0.047*	<0.001*
Functional limitation	<0.001*	0.004*	NS	NS	<0.001*
Physical pain	<0.001*	NS	NS	NS	<0.001*
Psychological discomfort	NS	NS	NS	NS	NS
Physical disability	<0.001*	NS	NS	NS	0.006*
Psychological disability	NS	NS	NS	NS	0.003*
Social disability	NS	NS	NS	NS	0.014*
Handicap	NS	NS	NS	NS	0.010*

Note: Results of Mann-Whitney *U* test. * indicates significant differences ($p < .05$), while NS denotes no significant differences.

and remission before finally 'burning out'.[27] Once again, the psychological discomfort domain was most affected and no significant differences in this domain were discerned among the four TMJ DJD subgroups. In addition to psychosocial impacts, patients with TMJ DJD may also suffer from comorbid sleep disturbances, which could also impair life quality.[28] The latter warrants thorough investigation in future studies.

4.3 | Pair-wise comparisons and TMJ DJD management

As the difference in global OHIP scores was insignificant between ER and LR as well as EO and LO, the severity of TMJ DJD did not appear to affect overall OHRQoL much. TMJ pain affected OHRQoL more as evidenced the significant differences in global OHIP scores

between NA-NN, ER-EO and LR-LO. Significant differences in scores between LR-LO were observed for most domains but not for ER-EO. TMJ DJD should thus be identified at its early stage and managed proactively before the various aspects of OHRQoL are diminished.

The goals of TMJ DJD management include pain relief, inhibiting the progression of cartilage/subchondral bone destruction and restoring joint function.[6] Conservative interventions with non-steroidal anti-inflammatory drugs, physical therapy and splint therapy are generally effective in alleviating signs and symptoms. Anterior repositioning splint therapy was shown to facilitate condylar repair and regeneration in early-stage TMJ DJD in a randomised clinical trial involving adolescents/young adults.[29] This corroborated findings of earlier retrospective studies specifying condylar bone formation with the use of both anterior repositioning and stabilisation splints.[30,31] More recently, stabilisation splint therapy was determined to lessen bone destruction and foster condylar bone re-modelling in patients with idiopathic condylar resorption.[32] TMJ surgeries, varying from minimally invasive TMJ arthrocentesis to complex total joint replacements, are normally considered only if patients fail to respond to conservative therapy.[33] As the psychological domains featured prominently, psychosocial care needs to be incorporated into the management of patients with TMJ DJD. Psychosocial care is defined as the 'culturally sensitive provision of psychological, social and spiritual care through therapeutic communications'[34] and includes supportive psychotherapy, cognitive behavioural therapy, interpersonal therapy, counselling and wellness programmes. Psychosocial interventions have been shown to reduce both psychological and physical symptoms, increase coping, enhance quality of life and improve function.[35,36]

4.4 | Study limitations

The interesting outcomes of this study must be considered together with its limitations. First, healthy controls without TMDs were not entered into the study to avoid unnecessary radiation exposure from CBCT imaging. The variation in OHRQoL is anticipated to be even greater if participants with normal TMJs were used for comparison. Second, while the ideal allocation ratio is one, it was not possible to predict the distribution of the TMD subtypes prospectively. Furthermore, the categorisation of TMJ DJD subgroups could only be accomplished after appraising the CBCT images. To mitigate the probability errors of unequal variances, a larger sample size (from selecting a higher allocation ratio) and non-parametric statistical analyses were applied. Third, although the OHIP-TMD may be more specific, sensitive and responsive than generic OHRQoL measures,[9,10] it is still disposed to various biases as with all self-reported surveys. These may include social desirability, recall, measurement error and other partialities.[37]

5 | CONCLUSION

Within the limitations of this study, the following conclusions were established:

1. A female predominance of TMJ DJD was detected.
2. TMJ pain had a substantial influence on the OHRQoL of patients with TMJ disc displacements and/or degenerative joint disease.
3. For patients with TMJ osteoarthritis, the physical pain and psychological domains were most diminished.
4. Patients with late TMJ osteoarthritis were significantly more impaired in the majority of OHRQoL domains than those with late TMJ osteoarthrosis.
5. Psychosocial care should be incorporated into the management of patients with TMJ osteoarthritis.

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CONFLICT OF INTEREST

The authors have no financial or personal conflict of interest to declare.

AUTHOR CONTRIBUTIONS

Yap AU performed conceptualisation, data curation, formal analysis, investigation, methodology, resources, supervision, validation and visualisation, and wrote original draft. Zhang XH involved in conceptualisation, data curation, formal analysis, investigation, methodology, project administration, software and validation, and reviewed and edited the document. Cao Y involved in data curation, formal analysis, project administration, supervision and validation, and reviewed and edited the document. Fu KY involved in conceptualisation, data curation, funding acquisition, investigation, methodology, project administration, resources, supervision and validation, and reviewed and edited the document.

PEER REVIEW

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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