

Prevalence of self-reported pain-related temporomandibular disorders and association with psychological distress in a dental clinic setting

Journal of International Medical Research

48(9) 1–12

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DOI: 10.1177/0300060520951744

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Abstract

Objectives: To investigate the prevalence of self-reported pain-related temporomandibular disorders (TMDs) and its association with psychological status in a dental clinic setting.

Methods: In this cross-sectional study, patients were asked to complete a TMD pain screener and the Patient Health Questionnaire-4 (PHQ-4). Correlations between symptoms of pain-related TMDs and PHQ-4 scores were analysed using Spearman's correlation test. Symptoms of pain-related TMDs were compared between four groups of participants with different psychological profiles using the Kruskal–Wallis test followed by multiple comparisons. The level of significance was adjusted using the Dunn–Bonferroni test.

Results: The prevalence of self-reported pain-related TMDs was 22.2%. TMD pain score was positively correlated with PHQ-4 score. The high anxiety and the comorbidity groups had significantly higher TMD pain scores than the controls.

Conclusion: There was a high prevalence of self-reported pain-related TMDs, which was correlated with scores on all psychological assessment scales. Symptoms of pain-related TMDs were significantly greater in patients with high anxiety scores, regardless of depression level.

Keywords

Pain, comorbidity, psychosocial, depression, anxiety, screener, temporomandibular joint disorders, dental clinics, Patient Health Questionnaire

Date received: 18 March 2020; accepted: 30 July 2020

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Introduction

Pain arising from temporomandibular disorders (TMDs) is one of the most common chronic pain conditions after headache and back pain.¹ TMD pain is also the second most common oral pain symptom, second only to toothache.^{2,3} The population prevalence of TMD signs and symptoms, including those other than pain around the joint area (such as clicking joint sounds and limited jaw movement), is up to 50%,¹ but few patients seek medical advice for TMDs.^{1,4,5} Pain is the main complaint when patients do seek medical advice.^{1,4,5} There is increasing evidence of an association between sociodemographic status and TMDs; there is a high incidence of TMDs in individuals aged 18 to 44 years, and women have four times the odds of having TMDs than men.^{6,7} The prevalence in children and adolescents ranges from 7% to 30%.⁸

Chronic TMD pain is often complicated with negative psychosocial conditions, which leads to depression, disability and impaired overall health and quality of life.^{9–14} Chronic pain has negative psychosocial effects, which are in turn crucial in the initiation and perpetuation of TMD pain.^{10,15–18} The association between TMD pain and negative psychosocial status occurs in both children and adults.^{17,19,20} Therefore, it is important to always evaluate psychosocial characteristics of TMD patients, as proposed in the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD).^{21,22} One prospective cohort study showed that people with depression and/or anxiety are approximately twice as likely to develop TMD pain.²³ A cross-sectional study found an association between psychosocial distress (anxiety or depression) and myofascial pain.²⁴ However, studies separately evaluating

anxiety and depression as associated factors of pain-related TMDs are still lacking.

In this study, a TMD pain screener and the Patient Health Questionnaire-4 (PHQ-4) were used to determine the prevalence of self-reported pain-related TMDs among patients attending Suranaree University of Technology (SUT) dental clinic, to investigate the correlation between PHQ-4 total scores (and anxiety and depression subscale scores) and symptoms of pain-related TMDs, and to compare levels of pain-related TMD symptoms between subjects with different psychological profiles.

Methods

Study design and subjects

This study was approved by the Ethics Committee for Research Involving Human Subjects, SUT (Project code EC-61-75). In this cross-sectional study, all patients aged 18 years or older who attended a dental clinic at SUT hospital in October 2018 were given an information sheet about the study. Those who volunteered to participate provided written informed consent. Patients who visited the clinic several times during the month were asked to complete a set of self-report questionnaires on their first visit. The questionnaires assessed symptoms of pain-related TMDs and psychological distress. Demographic data (sex and age) were also obtained. As research using precise methodology in a dental clinic setting is lacking, the required sample size was calculated based on previous related studies.^{25,26} A minimum of 166 participants were needed to determine the prevalence of pain-related TMDs and its correlation with psychological distress levels, based on a confidence interval of 95% and a power of 80%.

TMD pain evaluation

Participants answered the long version of a TMD pain screener, which contained six items assessing symptoms of pain-related TMDs. This TMD pain screener has been validated in a clinical setting and has demonstrated excellent sensitivity and specificity for screening pain-related TMDs.²⁷ The questionnaire items include duration of pain in the jaw or temple area, presence of pain or stiffness in the jaw on waking, and activities that affect the pain, such as chewing hard food, jaw movements, jaw habits and other jaw activities. The score ranges from 0 to 7; a score of 3 is considered to indicate pain-related TMDs.²⁷

Psychological evaluation

Each participant completed the PHQ-4, a reliable and valid tool for screening depression and anxiety disorders.²⁸ The questionnaire consists of four items and was designed to be used in general practice with accurate results.^{22,28} Item scores range from 0 (not at all) to 3 (nearly every day). The total possible score ranges from 0 to 12; higher scores indicate greater severity. A score ≤ 2 indicates none-to-minimal levels of depression or anxiety, 3 to 5 indicates mild levels, 6 to 8 indicates moderate levels and ≥ 9 indicates severe levels.²⁸ As the PHQ-4 combines the Patient Health Questionnaire-2 (PHQ-2, a depression screener) and the Generalized Anxiety Disorder-2 scale (GAD-2, an anxiety screener), it can be used to separately evaluate depression and anxiety. Participants who scored ≥ 3 on the PHQ-2 and GAD-2 subscales were considered to show depression and anxiety, respectively.^{29–31}

Data analyses

The following descriptive statistics were performed: frequency counts for sex and TMD pain screener responses, mean and

standard deviation for age, and median and interquartile range for TMD pain, PHQ-4, PHQ-2 and GAD-2 scores. Comparisons of PHQ-4, PHQ-2 and GAD-2 scores between participants with and without pain-related TMDs were conducted using the Mann–Whitney U test. Spearman's correlation test was used to assess how TMD pain score correlated with PHQ-4, PHQ-2 and GAD-2 scores. To compare symptoms of pain-related TMDs between participants of different psychological backgrounds, participants were categorized into four groups: a control group (scores < 3 on both the PHQ-2 and GAD-2), a high anxiety group (PHQ-2 scores < 3 and GAD-2 scores > 2), a high depression group (PHQ-2 scores > 2 and GAD-2 scores < 3) and a comorbidity group (scores of at least 3 on both the PHQ-2 and GAD-2). TMD pain scores between groups were compared using the Kruskal–Wallis test, followed by multiple comparisons and adjustment of the significance level using the Dunn–Bonferroni test. All statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Statistical significance was recognized at $P < 0.05$. Only questionnaires with complete information were included in the statistical analyses.

Results

In total, 221 patients (97% response rate) participated. All received questionnaires were complete with no missing data. Table 1 shows the frequency of each reported pain-related TMD symptom. The demographic data and psychological profiles of the participants are shown in Table 2. Approximately 52% ($n = 114$) reported at least one symptom of pain-related TMDs and 49 patients scored > 2 on the TMD pain screener. The overall prevalence of self-reported pain-related

Table 1. Frequency of each reported TMD pain screener item

TMD pain screener questions	Frequency, n (%)
In the last 30 days, on average, how long did any pain in your jaw or temple area on either side last?	
– No pain	156 (70.6)
– Pain comes and goes	58 (26.2)
– Pain is continuous	7 (3.2)
In the last 30 days, have you had pain or stiffness in your jaw on awakening?	
– No	170 (76.9)
– Yes	51 (23.1)
In the last 30 days, did the following activities change any pain (that is, make it better or make it worse) in your jaw or temple area on either side?	
– Chewing hard or tough food	75 (33.9)
– Opening your mouth or moving your jaw forward or to the side	31 (14)
– Jaw habits such as holding teeth together, clenching, grinding or chewing gum	30 (13.6)
– Other jaw activities such as talking, kissing or yawning	18 (8.1)

TMD: temporomandibular disorder.

TMDs was 22.2%; the prevalence for men and women was 13.5% and 26.5%, respectively.

Generally, the PHQ-4 scores showed that patients attending the SUT dental clinic exhibited none-to-minimal anxiety and depression. One-third of participants had a mild degree of the conditions. The prevalence of depression and anxiety, as indicated by PHQ-2 and GAD-2 scores, was 9.5% ($n=21$) and 11.8% ($n=26$), respectively (Table 2). Those with pain-related TMDs had significantly higher scores on the PHQ-4 ($\eta^2=0.12$, $P<0.001$), PHQ-2 ($\eta^2=0.07$, $P<0.001$) and GAD-2 ($\eta^2=0.11$, $P<0.001$) (Table 2).

Spearman's correlation showed that TMD pain screener scores for the whole sample were positively correlated with PHQ-4, PHQ-2 and GAD-2 scores (all $P<0.001$). The correlation between TMD pain screener scores and PHQ-2 scores ($r=0.295$) was weaker than that between TMD pain screener scores and PHQ-4 scores ($r=0.367$) and between TMD pain and GAD-2 scores ($r=0.367$). Both men and women showed significant correlations between the scores (all $P<0.025$) (Table 3).

The high anxiety and comorbidity groups had significantly higher TMD pain screener scores than the control group ($\eta^2=0.04$, $P<0.05$). The high depression group showed higher median TMD pain scores than the control group, but the difference was not significant (Table 4).

Discussion

Sociodemographics

In the present study, more than half of participants reported having at least one symptom of pain-related TMDs, which is high compared with a Saudi Arabian study using the same TMD pain screener.³² This may be a result of age differences: participants' mean age in the present study was 43.3 ± 14.9 years, whereas in the Saudi Arabian study it was 21 to 25 years. An age difference in prevalence was also found in a study in Taiwan, which showed that TMD prevalence in participants aged 26 to 55 years was twice that of those younger than 25 years.³³ Several other studies conducted in dental clinics using a variety of methodologies have also found lower

Table 2. Comparisons of age, sex and PHQ-4, PHQ-2, and GAD-2 scores between non-pain-related TMD and pain-related TMD groups

	Total (n = 221)	Non-pain-related TMDs (n = 172)	Pain-related TMDs (n = 49)
Age, mean ± SD	43.4 ± 14.9	45.3 ± 14.43 ^a	36.5 ± 14.9 ^b
Sex			
Male, n (%)	74 (33.5)	64 (37.2)	10 (20.4)
Female, n (%)	147 (66.5)	108 (62.8)	39 (79.6)
PHQ-4 score			
Median (IQR)	2 (1–4)	1 (0–3) ^a	4 (2–5) ^b
None-to-minimal, n (%)	131 (59.3)	115 (66.9)	15 (30.6)
Mild, n (%)	76 (34.4)	51 (29.7)	25 (51)
Moderate, n (%)	12 (5.4)	4 (2.3)	8 (16.3)
Severe, n (%)	2 (0.9)	1 (1.1)	1 (2.1)
PHQ-2 score			
Median (IQR)	1 (0–2)	0 (0–1) ^a	1 (1–2) ^b
PHQ-2 < 3, n (%)	200 (90.5)	162 (94.2)	38 (77.6)
PHQ-2 > 2, n (%)	21 (9.5)	10 (5.8)	11 (22.4)
GAD-2 score			
Median (IQR)	1 (0–2)	1 (0–2) ^a	2 (1–3) ^b
GAD-2 < 3, n (%)	195 (88.2)	159 (92.4)	36 (73.5)
GAD-2 > 2, n (%)	26 (11.8)	13 (7.6)	13 (26.5)

The same superscript letters indicate no statistical differences between groups at $P < 0.001$.

PHQ-4: Patient Health Questionnaire-4; PHQ-2: Patient Health Questionnaire-2; GAD-2: Generalized Anxiety Disorder-2; TMD: temporomandibular disorder; SD: standard deviation; IQR: interquartile range.

Table 3. Spearman correlations between TMD pain, PHQ-4, PHQ-2 and GAD-2 scores

	PHQ-4 and TMD pain		PHQ-2 and TMD pain		GAD-2 and TMD pain	
	r	P	r	P	r	P
Total	0.367	<.001	0.295	<.001	0.367	<.001
Male	0.393	.001	0.296	.01	0.397	<.001
Female	0.365	<.001	0.302	<.001	0.365	<.001

TMD: temporomandibular disorder; PHQ-4: Patient Health Questionnaire-4; PHQ-2: Patient Health Questionnaire-2; GAD-2: Generalized Anxiety Disorder-2.

Table 4. Comparison of TMD pain between groups of subjects according to psychological assessment

	Control (n = 185)	High depression (n = 10)	High anxiety (n = 15)	Comorbidity (n = 11)
TMD pain score, Median (IQR)	0 (0–2) ^a	1.5 (0–4) ^{a,b}	2 (1–3.5) ^b	3 (1.5–3.5) ^b

The same superscript letters indicate no statistical differences between groups at $P < 0.05$.

TMD: temporomandibular disorder; IQR: interquartile range.

prevalence of TMD pain symptoms (3.5% to 27%).^{34–36} There are also cross-cultural differences in pain reporting; for example, Thai participants are more likely to report orofacial pain symptoms than Finnish participants.³⁷ Another study comparing the prevalence of TMD pain in Chinese and Swedish people found that the former reported higher prevalence.³⁸ Sensitivity to pain, as determined by quantitative sensory testing, is lower in White individuals than in non-Whites, corroborating the cross-cultural differences in orofacial pain prevalence.³⁹ In the present study, a score of ≥ 3 on the pain screener indicated self-reported pain-related TMDs, the prevalence of which was 22.2%, which is slightly higher than reported in studies conducted in northern Jordan (20.7%) and Serbia (16.4%).^{40,41} A self-report pain instrument was used in the present study, so some patients with dental pain (which can mimic TMD pain) may have been included. Therefore, the real prevalence of pain-related TMDs may be lower.

A higher proportion of women than men showed pain-related TMDs in this study (Table 2), a finding in accord with those of several other studies in a range of settings.^{3,15,35,40,42–44} This sex difference in pain may stem from interactions between biological, psychological and sociocultural factors, although the exact mechanism underlying these interactions is unknown.⁴⁵ There is evidence from large-sample case-control studies that women have greater pain sensitivity,³⁹ that female sex is more strongly associated with TMD-related genes⁴⁶ and that women have greater odds of having depression and anxiety.⁴⁷ In our study, both sexes demonstrated comparable correlations between TMD pain and psychological distress scores (Table 3). A previous prospective cohort study found that high levels of depression and anxiety were also associated with increased risk of developing TMD, regardless of demographic

characteristics.⁴⁸ Psychological factors seem to influence TMDs equally in both sexes, whereas biological factors may have a more dominant role in women.

The observed prevalence of depression (9.5%) and anxiety (11.8%) (Table 2) was higher than that found for the general population of Thailand (determined using a different diagnostic measure), which was lower than 4%.^{49,50} The higher prevalence in the present study may be because of differences in study setting. A previous study showed that a higher proportion of dental patients had psychological distress compared with a non-patient group,⁵¹ which is additional evidence for the high prevalence of self-reported pain-related TMDs in dental clinics found in the present study.

Depression

There was a weakly significant correlation between TMD pain and depression in both sexes in this study. This is in line with findings from a previous study using a different methodology.⁵² Other studies have identified an association between depression and (both pain-related and non-pain-related) TMD symptoms.^{14,34} Studies of high school and college students, however, have failed to demonstrate an association between TMD symptoms and depression.^{20,53} Patients with pain-related TMDs also demonstrate higher depression scores than controls, as found in the present study and in previous studies.^{34,41,54–57}

There was no significant difference in TMD pain level between the control and the high depression groups. This negative finding may be a result of the small sample in the depression group. One longitudinal study demonstrated that the depression cohort was at significant risk of developing TMD;⁵⁸ therefore, the depression group in the present study was expected to demonstrate more TMD symptoms. However, the aforementioned study⁵⁸

did not take into account anxiety, which may have confounded the results (as anxiety and depression are highly correlated).^{17,57} Although the precise interaction between TMDs and depression remains unclear, the literature suggests that all patients with pain-related TMDs exhibit some degree of depression. The presence of pain-related TMDs among depressive subjects requires further investigation.

Anxiety

Another psychological factor that affects TMD pain is anxiety. As measured by the GAD-2, anxiety was significantly correlated with TMD pain in both men and women, a finding that supports those of other studies using different measures.^{34,52,53,59} Patients with pain-related TMDs also showed substantially higher anxiety than controls, which is in line with findings from a previous study that used a similar anxiety measurement scale⁵⁷ and other studies using different methods.^{34,54–56}

Unlike the high depression group, patients in the high anxiety and the comorbidity groups reported significantly higher TMD pain scores than controls. To the best of our knowledge, this is the first study to compare TMD pain between individuals with anxiety, depression and both conditions, and the results suggest that anxiety is the factor most strongly associated with pain-related TMDs. This is in accord with a previous cross-sectional study showing that anxiety, but not depression, is a risk indicator of myofascial pain.⁵⁴ However, one retrospective study showed that, although the proportion of severe anxiety increased as disability levels increased in chronic TMD patients, anxiety played a less important role than depression in chronic TMD.¹⁷ Therefore, the role of anxiety and depression in various aspects of TMDs have yet to be clarified. As these two disorders are closely correlated,^{17,57,59}

identifying which disorder is more relevant to the development of TMDs is a challenge.

Comorbidity

Eleven participants scored >2 for both GAD-2 and PHQ-2 items and were classified into the comorbidity group. This group demonstrated significantly greater levels of TMD pain than the control group. The comorbidity group also showed more TMD pain symptoms than the high anxiety and the high depression groups, but the differences were not significant. This is the first study to compare the level of TMD pain between individuals with high anxiety symptoms, high depression symptoms and both, using measures recommended by the DC/TMD.²¹ One previous study that examined the association between the coexistence of anxiety and depression and TMDs showed that patients with migraine together with anxiety and depression showed more TMD diagnoses than those with only migraine.²⁴ One study of individuals with TMDs found a higher percentage of individuals with both severe anxiety and severe depression than those with severe anxiety or severe depression alone.¹⁷ These findings confirm a strong association between psychological factors and TMDs, but these interactions are still not completely understood. Future studies investigating whether the presence of multiple factors has additive effects on the development and progression of different types of pain-related TMDs are needed.

Limitations

There were some study limitations. First, as this was an epidemiological study, the direction in which TMD pain and psychological distress affect each other could not be established. Socioeconomic status (SES), which was not measured in this study, may have confounded the observed

association between TMD pain and psychological distress, as low SES has been associated with poor oral health and psychiatric diagnoses such as depression.^{60,61} However, a large prospective cohort study revealed that most socioeconomic measures, including education and income, were not associated with the onset of TMDs.⁶² Another study in northern Finland also found no association between SES and pain-related TMDs, which is likely explained by the equalized standard of living in the country.⁶³ In Thailand, there has been a Universal Health Coverage scheme since 2001, which has improved dental care access across all socioeconomic groups.⁶⁴ Therefore, the effect of SES on the present results is probably minimal.

The TMD pain screener did not differentiate between acute and chronic symptoms of pain-related TMDs. As pain chronicity and psychosocial conditions are interrelated,^{10,17,18} future studies that focus on the time course of TMD pain in relation to various subtypes of psychosocial distress may yield more meaningful results. In addition, this research was conducted at a single dental clinic, so the sample may not be representative of the whole population. A multicentre study with a large sample is needed to ensure that the results are generalizable to a larger population. Finally, the number of subjects in the high depression, high anxiety and comorbidity groups was small, which might explain the non-significant differences in TMD pain between the high depression group and the controls, and between the three psychological distress groups.

Conclusion

The prevalence of self-reported pain-related TMDs among patients attending the SUT dental clinic was high. Significant positive correlations were observed between symptoms of pain-related TMDs and scores on

the PHQ-4, PHQ-2 and GAD-2, regardless of sex. Symptoms of pain-related TMDs were significantly greater in patients with self-reported high anxiety, regardless of depression. These results suggest an association between TMD pain and psychological distress. Patients presenting with pain-related TMDs in dental clinics would benefit from screening for psychological distress, and vice versa.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

Funding

This study was supported by Suranaree University of Technology (grant number: COA no. 62/2561).

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