

Clinical Pain Research

Clara Stålnacke*, Niels Ganzer, Per Liv, Anders Wänman and Anna Lövgren

Prevalence of temporomandibular disorder in adult patients with chronic pain

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Abstract

Objectives: Chronic pain patients often suffer in multiple locations. In health care, examinations of bodily pain usually do not include questions about temporomandibular disorders (TMD); hence TMD symptoms and potential comorbidities are not regularly assessed. Therefore, the primary aim was to evaluate the prevalence of TMD in patients referred to a pain rehabilitation clinic, and the secondary aim was to evaluate possible factors associated with TMD symptoms.

Methods: Consecutive chronic pain patients referred to the Pain Rehabilitation Clinic at the Umeå University Hospital in Sweden were included. TMD symptoms were assessed using three valid screening questions – 3Q/TMD. Pain sites, emotional distress, kinesiophobia, and demographics were obtained from the Swedish Quality Registry for Pain Rehabilitation.

Results: In total, 188 (144 women) chronic pain patients (mean age 41.8 years) were included. Of these, 123 (96 women) answered affirmatively to at least one of the 3Q/TMD. The relative risk of TMD symptoms among the patients with chronic pain, in comparison to the general

population, was 7.1 (95% CI 5.9–8.4). Age was the only independent variable associated with TMD among the patients ($p = 0.018$).

Conclusions: The prevalence of TMD symptoms was higher in a chronic pain population compared to the general population. The 3Q/TMD questionnaire could be a suitable screening tool at pain rehabilitation clinics to identify patients for further examination of involvement of pain in the trigeminal region. Our results reinforce the clinical importance of paying attention to concurrent widespread pain and local TMD symptoms.

Keywords: chronic pain; prevalence; temporomandibular disorders.

Introduction

Chronic pain is a common condition that is related to individual suffering, sick leave and care-seeking behaviours [1, 2]. Thus, the global burden of chronic pain is a challenge not only for the individual but also in regard to high costs for society [3]. Individuals with chronic pain often report complaints in multiple anatomical regions [3]. For 10–15% of these individuals, the pain is even characterised as widespread or as a generalized pain condition [4, 5]. Among individuals with widespread pain, concurrent orofacial pain is as frequent as 50–75% [6, 7].

Chronic pain conditions in the orofacial area are commonly related to temporomandibular disorder (TMD) [8]. The term TMD embraces musculoskeletal symptoms of the masticatory muscles and the temporomandibular joint (TMJ). Patients with TMD typically report jaw/face pain, pain on jaw movements, temporomandibular joint sounds, and impaired jaw mobility [9]. The prevalence of TMD pain is estimated at 10% in the general population [10, 11]. Among individuals with TMD symptoms, one out of five reports widespread bodily pain [12, 13].

Interestingly, the presence of TMD pain predicted the onset of spinal pain and *vice versa* during a two years follow-up [14], thus indicating common pathophysiological mechanisms and individual vulnerability for

*Corresponding author: Clara Stålnacke, Orthodontic Clinic, Region Gävleborg, Gävle, Sweden

E-mail: clara.stalnacke@regiongavleborg.se

Niels Ganzer: Orthodontic Clinic, Region Gävleborg, Gävle, Sweden; Department of Orthodontics, Faculty of Odontology, Malmö University, Malmö, Sweden; and Department of Research and Development, Region Gävleborg/Uppsala University, Gävle, Sweden, E-mail: niels.ganzer@regiongavleborg.se

Per Liv: Section of Sustainable Health, Department of Public Health and Clinical Medicine, Umeå University, Umeå, Sweden, E-mail: per.liv@regionvasterbotten.se

Anders Wänman: Faculty of Medicine, Department of Odontology/Clinical Oral Physiology, Umeå University, Umeå, Sweden, E-mail: anders.wanman@umu.se

Anna Lövgren: Faculty of Medicine, Department of Odontology/Clinical Oral Physiology, Umeå University, Umeå, Sweden, E-mail: anna.lovgren@umu.se

development of chronic pain. Therefore, in individuals with TMD pain and concurrent widespread pain, the pain complaint could rather be related to central sensitization with generalised hyperalgesia than to local factors such as clenching and grinding. As a consequence of this difference in pathophysiology, a standard single treatment with occlusal appliances may have a poor prognosis, and instead multimodal strategies may be required [15].

Even though the aetiology is not fully understood, chronic pain conditions are associated with different interactions of physical and psychosocial factors. Individuals with chronic pain often report psychosocial comorbidities, and the presence of these factors contributes to the maintenance and spreading of pain [16–18]. Among the psychosocial factors, depression, stress, anxiety, and pain-related fear of movement show an association with chronic pain [19, 20]. Also, these symptoms are associated with worse prognosis in chronic pain management [18, 20]. In summary, a complex interrelationship exists between pain and psychosocial factors. Therefore, a biopsychosocial approach should be adopted in chronic pain assessment and management [21].

In Sweden, chronic pain and TMD are two conditions that clinically are handled separately and in different health care systems. Chronic pain patients are diagnosed and treated by primary health care, and when needed are referred to a pain specialist clinic. Patients with TMD symptoms are diagnosed and treated by general dentists, and if necessary are referred to a specialist dental clinic. At these tertiary pain rehabilitation clinics, patients are assessed by multi-professional teams to establish a rehabilitation plan. Since these patients often suffer from pain in multiple locations, it is reasonable to assume that TMD symptoms are also common. However, surveys of bodily pain usually do not include questions about TMD symptoms [22]. Consequently, physicians and physiotherapists do not regularly assess TMD. Therefore, there is a need for an evaluation of the prevalence of TMD among patients at pain rehabilitation clinics in order to include the possibility of trigeminal involvement in chronic pain patients.

Aim

Our primary aim was to evaluate the prevalence of TMD in patients referred to a pain rehabilitation clinic, together with the prevalence ratio when compared to the general population. Our secondary aim was to evaluate factors associated with TMD symptoms. We hypothesised that the sample from the pain rehabilitation clinic would show a

higher prevalence of TMD symptoms when compared to the general population.

Methods

Study setting and participants

This cross-sectional study comprises a cohort of consecutive chronic pain patients who were referred from primary health care to the Pain Rehabilitation Clinic at Umeå University Hospital in Sweden. Patients enrolled from September 7, 2016 to November 1, 2017 were included.

Procedure

Data were collected from the Swedish Quality Registry for Pain Rehabilitation (SQRP) [23]. The SQRP [23] was started in 1998 and collects data on patients in working ages (18–67 years) from the majority of clinical departments on the pain specialist level in Sweden. Data are based on Patient-Reported Outcome Measures (PROM) and are collected from standardised patient surveys. All participants completed the standardised questionnaires included in the SQRP, before the clinical examination at the Pain Rehabilitation. In addition, TMD symptoms were assessed by use of three valid screening questions for TMD – the 3Q/TMD [10]. In total, 238 individuals were eligible for inclusion. Among those, 50 individuals did not answer the screening questions for TMD in their questionnaires, and thus, were excluded from the final study sample ($n = 188$).

Questionnaires

Temporomandibular disorders: The presence of symptoms indicative of TMD was assessed according to the patients' answers to the 3Q/TMD that was formulated as follows:

- Q1. Do you have pain in your temple, face, jaw or jaw joint once a week or more?
- Q2. Do you have pain once a week or more when you open your mouth or chew?
- Q3. Does your jaw lock or become stuck once a week or more?

Each of the three questions was answered with 'Yes' or 'No'. All patients who responded 'Yes' to at least one of the 3Q/TMD were categorised as 3Q-positives. Consequently, those patients who answered 'No' to all three questions were categorised as 3Q-negatives. The two questions on pain were first introduced in 2005 to screen for TMD pain in adolescents [24]. The third question was later added to embrace also the functional aspects of TMD complaints. The 3Q/TMD has been suggested valid for the identification of the most common TMD diagnoses [8]. Information on the prevalence of 3Q/TMD in the general population was retrieved from the Public Dental health services in Västerbotten, Sweden. Since May 2010, all individuals who undergo regular dental check-ups respond to the 3Q/TMD as a part of their medical history, wherein these data are collected as a part of daily clinical routines.

Pain sites: The number of pain sites was assessed from the SQRP that includes the statement 'mark all painful body parts in the following

list' with 18 body parts on each side of the body. The spatial extent of pain on the body was measured ranging from 0 to 36 pain sites (Figure 1). Pain sites were categorised as (1) local pain (head/face), (2) regional pain (head and neck), and (3) bodily pain (pain at any site in the rest of the body except the face and neck/shoulders) as modified from Suvinen and co-workers [25] and Koutris and co-workers [26].

Hospital anxiety and depression scale: The Hospital Anxiety and Depression Scale (HADS) [27] was used to identify symptoms of anxiety and depression, respectively. HADS consists of two subscales with seven items each for anxiety and depression. Each answer ranged from 0 to 3, whereby the respondents indicate how much it applies to them during the last week. Thus, the total scale for each subscale of anxiety or depression ranges between 0 and 21, and a higher score indicates a worse condition. The obtained scores were divided into three categories where a score of seven or lower implies no anxiety/depression, a score of 8–10 implies a mild disorder, and a score of 11 or higher is the cut-off for a possible clinically significant disease.

Tampa scale of kinesiophobia: The Tampa Scale of Kinesiophobia (TSK-Sv) [28] was used to identify symptoms of pain-related fear of movement. The TSK questionnaire comprises 17 items each with a 4-point Likert scale with scoring alternatives ranging from 'strongly disagree' (1) to 'strongly agree' (4). After inversion of the scores of items 4, 8, 12, and 16, the TSK summary score is calculated. The summary score ranges between 17 and 68 with the higher the TSK summary score the greater the fear of movement. The cut-off for a high degree of kinesiophobia/fear of movement is a TSK summary score >37 [29].

Statistical analyses

Descriptive statistics were used to characterise the study sample. The relative risk of TMD in the study group when compared to the general population was estimated using Poisson regression adjusted for age and sex.

Furthermore, predictive factors associated with TMD as the dependent variable were assessed using logistic regression modelling. The following independent variables were used in a multivariable model:

- i) Age
- ii) Sex
- iii) Level of anxiety
- iv) Level of depression
- v) Kinesiophobia

Age was modelled using natural cubic splines with three knots at the 10th, 50th, and 90th percentile of the age distribution. To handle missing data in this sample (Table 1), in particular 15% of the TSK scores, missing values were imputed using the R-function `aregImpute` from the `Hmisc` package [30]. Results were pooled across five imputed models.

All data for the study were collected and analysed such that individual patients remained anonymous. All statistical analyses were conducted in R version 3.5.3[31]. The STROBE checklist was followed [32].

Results

In total, 188 patients (144 women) between 17 and 66 years (median age 43.0) were included (Table 1). Of these, 123 (65.4%, 96 women) reported as 3Q-positive and were designated as TMD cases; the remaining 65 patients reported as 3Q-negative and were designated as healthy controls (Figure 1). The relative risk of TMD symptoms among patients with chronic pain when compared to the general population was 7.1 (95% CI 5.9–8.4).

In the overall sample, all individuals reported at least one pain site (five missing data). Among the 3Q-positives, the most frequently reported pain sites were lower back, neck, and shoulder. In the overall sample, 49.5% of the patients reported localised pain (pain located to the jaw, face or head), 83.0% regional pain, and 96.3% reported bodily pain, respectively (Table 1, Figure 2), with no significant difference between patients with bodily pain with and without concurrent TMD.

In the multivariable analysis, age was the only factor significantly associated with TMD symptoms ($p = 0.018$, Table 2). The prevalence of being 3Q-positive increased with increasing patient age up to the mid-forties (Figure 3). While kinesiophobia, anxiety, depression were not statistically significant predictors in the model, the confidence intervals revealed a marked uncertainty in their odds ratio estimates that ranged from below 0.5 to over 2 (Table 2).

Discussion

The present study showed that the every second of chronic pain patients referred to a specialised pain clinic, also reported concurrent frequent TMD symptoms. Therefore,

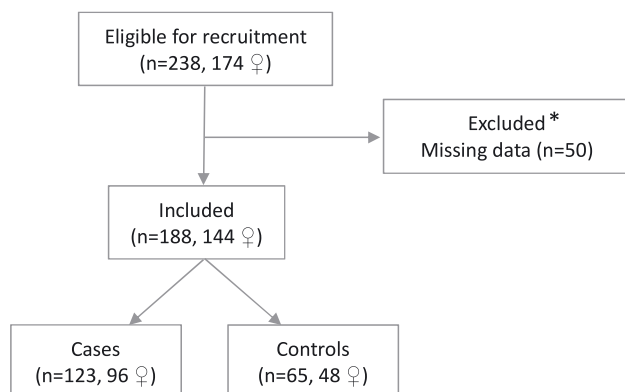


Figure 1: Flow chart of recruitment process and study participants, * excluded did not fill out the screening questions for temporomandibular disorders (TMD).

Table 1: Characteristics of patients with chronic disabling body pain (n=188) with (3Q-positive) and without (3Q-negative) symptoms related to temporomandibular disorders.

	3Q-positive (n=123)	3Q-negative (n=65)	Overall (n=188)
<i>Sex</i>			
Female	96 (78.0%)	48 (73.8%)	144 (76.6%)
Male	27 (22.0%)	17 (26.2%)	44 (23.4%)
<i>Age</i>			
Median (IQR)	44.0 (19)	39.0 (27)	43.0 (22)
<i>Kinesiophobia</i>			
No Kinesiophobia	48 (39.0%)	31 (47.7%)	79 (42.0%)
Kinesiophobia	55 (44.7%)	26 (40.0%)	81 (43.1%)
Missing	20 (16.3%)	8 (12.3%)	28 (14.9%)
<i>Anxiety level</i>			
Normal	53 (43.1%)	29 (44.6%)	82 (43.6%)
Borderline anxiety	26 (21.1%)	14 (21.5%)	40 (21.3%)
Anxiety	41 (33.3%)	20 (30.8%)	61 (32.4%)
Missing	3 (2.4%)	2 (3.1%)	5 (2.7%)
<i>Depression level</i>			
Normal	53 (43.1%)	36 (55.4%)	89 (47.3%)
Borderline depression	31 (25.2%)	9 (13.8%)	40 (21.3%)
Depression	35 (28.5%)	17 (26.2%)	52 (27.7%)
Missing	4 (3.3%)	3 (4.6%)	7 (3.7%)
<i>Pain</i>			
Local	63 (51.2%)	30 (46.2%)	93 (49.5%)
Regional	103 (87.7%)	53 (81.5%)	156 (83.0%)
General	118 (95.9%)	63 (96.9%)	183 (96.3%)

TMD are likely considerably prevalent among patients with chronic pain complaints. The only factor significantly associated with TMD was age, with increasing age until the mid-forties, i.e. kinesiophobia, anxiety, depression were not associated with TMD symptoms.

In general, the prevalence varies depending on the assessment method, frequency and duration of the condition. The prevalence of TMD pain in the general population is approximately 10% [34]. Due to the subjective nature of pain complaints, self-reported measures are regarded the best available approach for pain assessment. In the present study, we investigated a population of chronic pain patients concerning their TMD pain complaints as well as the functional disturbances related to TMD. In clinical practice, it is essential to use methods that are efficient to identify patients in need of treatment. One such method is the screening questions 3Q/TMD. The 3Q/TMD was primarily constructed as a screening tool for general dental practitioners to easily detect individuals who could benefit from a further TMD examination [10]. Thus, a frequency of 'once a week or more' was adopted to provide a limiting time frame and to include only those with more frequent symptoms. The prevalence of TMD among adults in the general population, is approximately 7% as measured by the 3Q/TMD. The prevalence of TMD is highest among individuals in working ages, and more so in women when compared to men [35].

In our sample, the results indicate that TMD symptoms seem to follow the same pattern in age distribution as in the general population, even though the prevalence is considerably higher. There could be numerous reasons for this higher presence or TMD symptoms in chronic pain patients. Individuals with any longstanding pain condition have a higher likelihood of developing another pain condition during the follow-up period after adjusting for age, gender, education, and level of depression [9]. In addition, widespread pain over a more extended period can cause general hyperalgesia due to central sensitization, and thus

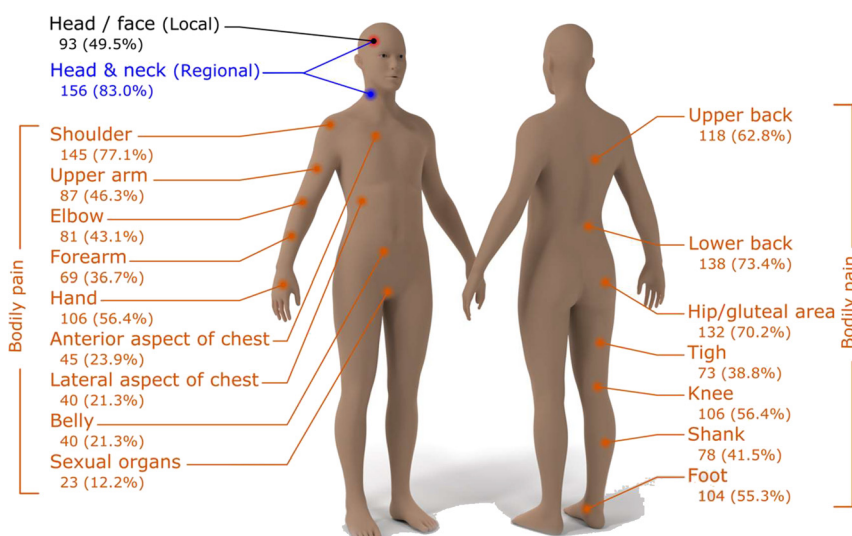
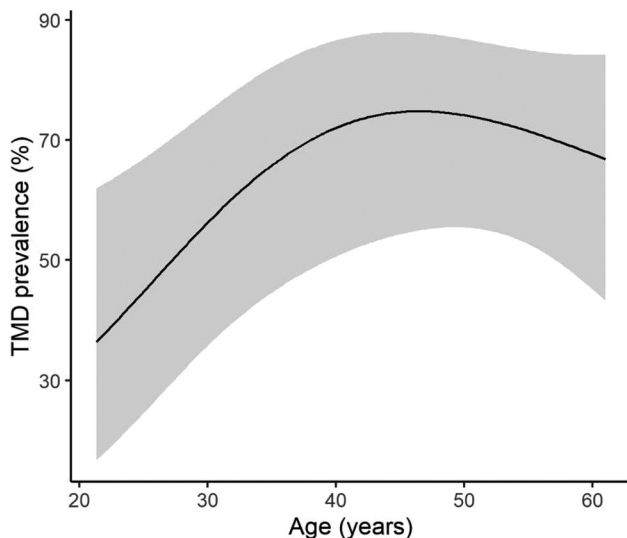
**Figure 2:** Distribution of pain sites in the study population (n = 188) divided into local (head), regional (head and neck) and bodily pain sites [33].

Table 2: Associations to temporomandibular disorders (TMD) used as dependent variable in the study sample (n=188).

Predictors	Odds Ratios	CI	p-Value
(Intercept)	0.10	0.01–0.78	0.028
Male	0.61	0.29–1.30	0.204
Age	<i>see Figure 3 for effect estimate</i>		0.018
Kinesiophobia	1.47	0.75–2.86	0.259
Borderline anxiety	0.90	0.38–3.16	0.822
Anxiety	1.04	0.41–2.66	0.930
Borderline depression	2.24	0.88–5.74	0.092
Depression	1.25	0.53–2.96	0.611
Observations	188		
R ² Tjur	0.036		

**Figure 3:** Association between age and temporomandibular disorders (TMD) prevalence among patients referred to a rehabilitation clinic due to chronic body pain, as estimated from multivariable logistic regression model (n=188). Grey bands represents 95% confidence interval.

local symptoms can be triggered due to lowered pain thresholds. Moreover, widespread pain has been identified as a risk factor for the onset of TMD in women [36]. Therefore, the higher prevalence could be related to a higher incidence of TMD among patients with spinal pain conditions or to a longer duration of the TMD symptoms, or to both.

Interestingly, the prevalence of orofacial pain complaint in the general population is on the rise [37]. Therefore, it is reasonable to assume that orofacial symptoms will also be more prevalent even in patients referred to specialist pain clinics. All in all, since the present study

confirms a considerable overlap between chronic bodily pain symptoms and orofacial pain complaints, screening for TMD in health care is reasonable, and the 3Q/TMD could be a suitable tool.

Previous studies have shown that patients with chronic pain and TMD share comorbidities such as somatic symptoms, depression [38], and sleep disturbances [39]. Also of relevance, management of chronic pain has a worse prognosis in patients with psychological symptoms [18, 20]. Therefore, the consideration of coexisting psychological symptoms is crucial in patients with chronic pain and TMD. In our sample, patients with chronic pain and TMD do not seem to differ from other chronic pain patients, and as a consequence, the treatment related has to be seen in the same perspective. Increased awareness regarding TMD and comorbid pain conditions may decrease the risk of treatment failure and result in improved diagnostics and prognosis [40]. Local factors such as clenching and grinding may (or may not) be comorbid factors in individuals with chronic pain from other parts of the body since these factors can be related to generalized hyperalgesia [41]. Raphael and Marbach have shown that patients with widespread pain do not respond to a standard single treatment with occlusal splints to the same extent as do patients with only TMD symptoms [15]. Instead, patients with widespread pain would benefit from a multimodal treatment program. Today, both dental care and pain rehabilitations clinics use multimodal treatment strategies in the management of chronic pain patients. Nevertheless, since individuals with chronic pain complaints may benefit from decreased pain input, even from the trigeminally innervated areas, awareness of locally mediated factors such as static load from clenching and grinding may be beneficial. In this aspect, the use of the 3Q/TMD as a screening tool even in health care may contribute to an improved and holistic assessment of the patient [10, 24].

All in all, the present study confirms previous findings in suggesting a frequent concurrency between TMD symptoms and chronic pain complaints outside the orofacial region [25, 42, 43]. Given the significant prevalence of TMD complaints in such patients, our results expose a potential shortage in current medical examinations. Although pain rehabilitation clinics are experts in diagnosing and in treatment of chronic pain patients, there are seldom routines for detecting TMD, and TMD symptoms remain unrecognized, underdiagnosed and undertreated. The distinct organizational differentiation between the health care system and dental care system can be another reason for undertreatment of TMD complaints. In Sweden, the public health insurance provides all patients access to health care for approximately €20 per visit and with a maximal annual

cost of €110. In contrast, in dentistry a fee for service system is adopted. Even though the social insurance system supports a certain percentage of the cost, there is no maximal annual cost cut-off. By tradition patients with TMD complaints are primarily managed in dentistry. Even in dentistry, patients with TMD are often underdiagnosed and undertreated [44]. Thus, there is an obvious risk that patients end up between systems. This reinforces the importance of a sufficient collaboration between health care and dental care for the provision of a proper management of patients with chronic pain and TMD.

Strengths and limitations

In the present study, we used valid questionnaires to assess pain complaints together with the psychosocial components that are possibly related to chronic pain. The diagnostic accuracy of the 3Q/TMD has been evaluated in both the general population and among patients referred to a pain specialist clinic for an orofacial pain complaint [45]. Since the accuracy of a diagnostic test differs depending on the studied population, it is reasonable to assume that the accuracy of the 3Q/TMD may vary slightly among patients referred for bodily pain complaints. Further validation of the 3Q/TMD in such a setting is therefore necessary. The small sample size resulted in low power in the multi-variable modelling of 3Q/TMD, as seen in the relative wide confidence intervals of the predictors. Also, due to the small number of participants, further subgroup analysis was not possible. Further, the sex distribution is uneven, with more women than men. However, since the sex distribution in this sample is representative of a population found in specialist pain centres, the generalisability of our findings is warranted.

Conclusions

The prevalence of TMD symptoms was considerably higher in our chronic pain population when compared to the general population. Our results reinforce the importance of paying attention to the comorbidity between widespread pain and local TMD symptoms and to evaluate TMD symptoms in the assessment of a patient with chronic pain complaints. The 3Q/TMD questionnaire could be a suitable screening tool for use at pain rehabilitation clinics to identify risk patients for further examination. Since this study comprises a relatively small sample, further studies are needed.

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Informed consent: Informed consent was obtained from all participants in the study and participation was entirely voluntary.

Ethical approval: The study was reviewed and approved by the Regional Ethical Review Board (Ref no 2016/227-31 Umeå University, Sweden). All procedures performed in the studies involving human participants followed the ethical standards of the regional research committee and in regard to the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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