

ORIGINAL ARTICLE

Prevalence of temporomandibular dysfunction and pain in adult general practice patientsBENGT ADÈRN¹, CHRISTER STENVINKEL², LOTTA SAHLQVIST³ & ÅKE TEGELBERG⁴

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Abstract

Objective. To analyse the prevalence of temporomandibular disorders and related pain (TMD-pain) among adult recall patients in general dental practice. **Materials and methods.** From November 2006 to September 2008, all adults attending a Swedish Public Dental Service (PDS) clinic for recall examination were asked two standardized questions about temporomandibular pain and dysfunction. Mouth-opening capacity was measured. The responses to the questions and mouth-opening capacity were combined to give a TMD-pain score, on a scale of 0–3. The patients' acceptance of their TMD condition was also noted. **Results.** The subjects comprised 2837 adults (53% females, 47% men). Of the total sample, 4.9% reported a TMD-pain score of 1–3. The gender difference was significant: women predominated ($p < 0.003$). Forty-three per cent of those with TMD-pain scores of 1–3 (36% men, 47% women) considered that the condition warranted treatment, especially those registering a pain score (significant difference between pain and dysfunction groups, $p < 0.000$). **Conclusions.** The TMD-pain score shows promise as a useful instrument for detecting and recording TMD-pain. The prevalence of TMD disclosed in the study is high enough to be considered a public health concern. Most of the subjects with lower scores on the TMD-pain scale accepted their condition as not severe enough to require treatment.

Key Words: acceptance, effectiveness, general dentistry, prevalence, TMD pain

Introduction

Many adults are afflicted by pain and dysfunction in the temporomandibular system and its muscles, joints and associated structures [1,2]. Collectively, these conditions are referred to as temporomandibular disorders (TMD) [3].

Epidemiological studies report a wide range of prevalence for TMD: from 4–15%. This is attributable to a lack of uniformity with respect to definitions of TMD disorders, sample sizes and the age ranges of the subjects [4]. Other epidemiological studies [1] show that ~12% of adults will have experienced pain in the face or jaws during the previous 6 months. The presence of a disorder does not necessarily imply that the patient wants to be treated. A recent meta-analysis [5] disclosed an estimated treatment need of 15%. However, there was a pronounced variation in prevalence and

treatment need, depending on the different criteria applied for defining TMD and for subject selection.

In order to optimize delivery of care for patients with TMD, an estimation of the prevalence and treatment need in the general population has to be actualized from time to time. The subjects' perceptions, i.e. acceptance or non-acceptance (treatment need) of conditions causing pain and/or dysfunction in the face and the jaws are of importance in care-planning [5]. There is a lack of current data on both prevalence of TMD and treatment need in a Swedish population of adults receiving regular dental care.

Aim

To analyse the prevalence of temporomandibular disorders and related pain (TMD-pain) and acceptance

or not of the condition among adults seeking dental care in a general dental practice setting.

Materials and methods

Materials

The study comprised all adults, 20 years of age or older, attending a PDS clinic in Fors, Eskilstuna, Sweden, for routine dental examination, from November 2006 to September 2008.

The clinic's recall system comprised a data set of ~4000 adult patients who attended annually or biannually, for routine dental examination. In terms of age and gender distribution, the Fors clinic was representative of PDS clinics in the County of Sörmland (~250,000 inhabitants).

Methods

The study comprised three parts:

- (1) The subjects, all adults, were asked two standardized questions about TMD-pain [6] at the dental examination: (Q1) 'Do you have pain in your temples, face, jaw joint or jaws, once a week or more?' and (Q2) 'Do you have pain when you open your mouth wide or chew, once a week or more?' Yes/no answer. To avoid misunderstanding, at the time of questioning, a diagram of the face was used to indicate the relevant sites (Figure 1).
- (2) Clinical measurement of maximum mouth-opening capacity in millimetres with a ruler, shown in Figure 2.
- (3) One question about the individual's acceptance or non-acceptance of their condition: (Q3) 'Do you accept your situation?' Yes/no answer.

Before the study start, all personnel at the clinic were informed of the project by the responsible senior consultant in Stomatognathic Physiology/Orofacial Pain. The dentists and dental hygienists who were to undertake the examinations were all individually trained and calibrated with one another and with the senior consultant responsible for the project.

Unassisted mouth-opening capacity and the overbite were measured with a ruler, in millimetres: these



Figure 1. Showing how the examiner demonstrated the localization of the TMD-pain to the patients.

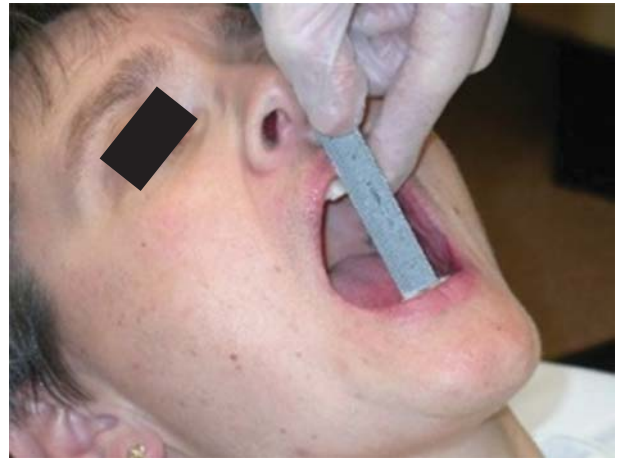


Figure 2. Illustration of unassisted maximum mouth opening capacity measured in millimetres with a ruler.

two measurements were added and referred to as mouth-opening capacity (Figure 2).

The patients were instructed to open their mouths as widely as possible, even if it hurt. The limit for normal mouth-opening capacity was set at >35 mm, in accordance with proposed criteria for 'limited opening capacity' in The Research Diagnostic Criteria (RDC-TMD) [3].

The responses to the two questions and the mouth-opening capacity were summarized in an index called the TMD-pain score, with a scale of 0–3 for dysfunction and pain. Score 0 represents no pain and dysfunction; 1 = no pain but dysfunction (limited opening capacity); 2 = pain but no dysfunction; 3 = pain and dysfunction. If a patient answered 'no' to question Q2, but experienced pain on mouth-opening, the response to Q2 was altered to 'yes' (Table I).

The TMD-pain score and mouth-opening capacity were noted in the computerized clinical records system. If the TMD-pain score was 1–3, the patient was asked about acceptance of the condition. Those who found their condition unacceptable because it detracted from their quality-of-life were offered active treatment.

Ethical approval

The study was approved by the regional ethics committee in Stockholm (Dnr 2008/1670-31/4) and was undertaken in conformity with the Declaration of Helsinki.

Statistics

After tabulation of the results, statistical analysis was based on all cases with valid data in the specific range for all variables in each table. Descriptive analysis was used with Pearson Chi-Square and Fisher's Exact Test for gender, age groups, TMD-pain score and

Table I. Derivation of TMD-pain score (0–3) by combination of responses to Q1 and Q2 and mouth-opening capacity.

Q1	Q2	Mouth opening capacity ≤35 mm	Mouth opening capacity >35 mm	TMD-pain score
No	No	No	Yes	0
No	No	Yes	No	1
Yes	Yes	No	Yes	2
Yes	No	No	Yes	2
No	Yes	No	Yes	2
Yes	Yes	Yes	No	3
No	Yes	Yes	No	3
Yes	No	Yes	No	3

acceptance of the condition. SPSS version 17.0 was used for statistical analysis.

Results

Initially, 3219 adults were consecutively registered at their first recall appointment. Because of faulty records and missing registrations in the clinical records, 382 individuals were excluded. The remaining 2837 subjects were examined by six dentists (who undertook 65% of the examinations) and four dental hygienists (35% of the examinations).

The distribution of male-to-female subjects in the study population was 47% ($n = 1345$) and 53% ($n = 1492$), respectively. For reference, the age and gender distributions at the study clinic and in the County of Sörmland are shown in Table II.

During the study period, ~14% of the patients were examined more than once. The results of the first examination were used in the study. A TMD-pain score of 1–3 was recorded in 138 patients, i.e. 4.9% (3.5% men and 6.1% women) of the total sample, with a significant difference between the genders ($p < 0.003$). The prevalence for TMD-pain scores 1–3 were, respectively, 1.2, 3.5 and 0.2% (Table III).

Sixty patients with TMD-pain scores of 1–3, i.e. 2.1% (1.3% men and 2.9% women), felt unable

to accept their condition without treatment, especially those with the more severe scores, 2 and 3 (TMD-pain score 1: 6%; score 2: 53% and score 3: 86%). A combination of scores 2 and 3 disclosed a non-acceptance rate of 55% of the patients, compared with only 6% of those with score 1. The difference was statistically significant ($p < 0.000$) (Table IV).

The mean value of mouth-opening capacity for all patients is shown in Table V. Forty-two patients, i.e. 1.5%, had a maximum mouth opening capacity of less than 36 mm.

Discussion

TMD encompasses ‘conditions of joint and muscle disorders in the orofacial area characterized by pain, joint sounds and irregular or deviating jaw function’ ([9], p. 174). The aim of this cross-sectional study was to determine the prevalence of TMD-pain in a population of adults who regularly attend a general dental clinic. The results disclose a high prevalence, similar to that of systemic diseases such as rheumatoid arthritis [7] and fibromyalgia [8]. From a public health perspective, this level of prevalence for TMD-pain indicates an unmet treatment need.

Over the years, many attempts have been made to determine the etiology of TMD. Structural changes

Table II. Age and gender distribution (in percentage) at the study clinic and the general population of the county at the study start.

Age	Age		Gender			
	Study clinic	County	Study clinic male	Study clinic female	County male	County female
20–29	24.2	13.6	12	13	7	6
30–39	19.1	15.6	10	10	8	8
40–49	20.6	17.8	10	9	9	9
50–59	16.6	17.6	8	7	9	9
60–69	11.8	17.4	6	5	9	9
70–79	5	10.4	3	4	5	6
80+	2.7	7.6	1	3	3	5
Total	100	100	50	51	49	51

Table III. Percentage distribution of prevalence of TMD-pain score in men and women.

	TMD-pain, %			Gender difference
	Male (<i>n</i> = 1345)	Female (<i>n</i> = 1492)	Total (<i>n</i> = 2837)	
Score 0	96.5	93.9	95.1	
Score 1	1.1	1.2	1.2	
Score 2	2.3	4.5	3.5	
Score 3	0.1	0.4	0.2	
Total	3.5	6.1	4.9	<i>p</i> < 0.003

and displacements in the joint, neuromuscular and occlusal disturbances and psychosocial factors have been implicated [9,10]. However, since the early 1980s there has been consensus that the cause of TMD is multifactorial [9]. Early diagnosis and treatment reduces the risk of persistence of the condition, with possibly increasing severity in the future [11,12]. If individuals with TMD pain can be identified early clinically, it might be possible to relieve persistent pain [12].

One means of early identification of TMD is to question patients about pain and to measure maximum mouth-opening capacity during a routine dental examination [13]. The introduction of the TMD-pain score as a screening index offers the potential of optimizing treatment planning at both individual and population levels. The instrument is easy to use and administer at both general practice and specialist levels and has shown good validity and reliability [13].

Among general dental practitioners, knowledge about TMD and examination procedures for early diagnosis of the condition varies [14]. To improve conformity, the Research Diagnostic Criteria (RDC-TMD) were introduced in 1992, addressing such controversial issues as calibration of examination and diagnostic criteria [3]. This scientific approach proved beneficial for assessment of individual patients by general dental practitioners and, on a population basis, as an aid to resource planning for delivery of care for patients with TMD [13].

In order to ensure examiner consistency in the present study [15], the specialist and the participating dentists and dental hygienists underwent theoretical and practical calibration-training before the study.

In an earlier study in a neighbouring Swedish county, all patients aged from 12–19 years, presenting for their

annual dental examination, were asked the same two questions about pain used in this study. The prevalence of TMD pain in this material of 28,899 adolescents was 4.2% [13], i.e. a slightly higher frequency than for the adults in the present study, 3.7%. This study result was based on registrations made under clinical conditions, at a routine examination, including a measurement of the maximum mouth-opening capacity.

Over time and throughout the course of life, adolescence and adulthood, the experience of pain may differ. Some of the variations may be attributable to differences in vulnerability to TMD pain and to questions asked about pain during pubertal development, because of biological (stage of pubertal development) and psychosocial factors (depression and/or lower life satisfaction) [16].

The prevalence of TMD and related pain in this study of adults was lower than in other studies [1,4,17]. Such differences may be attributable in part to lack of uniformity with respect to study design, case mix, criteria for TMD, age and gender groups. A strength in the present study was the calibration of the registration procedure before start. The importance of calibration in achieving an enduring change in professional behaviour has been demonstrated in a recent study of implementation, in general practice, of a new concept for endodontic treatment [18].

Pain associated with TMD has been disclosed as the most common reason for referral to a specialist [19]. The results indicated a similar situation in a general dental setting: pain was the chief complaint; painless, limited opening capacity was not a cause for complaint.

The gender difference in pain prevalence is in accordance with other studies [4]. Biological factors, e.g. oestrogen levels [20], DNIC (Diffuse Noxious Inhibitory Control) [21], genetics [22] and psychosocial factors such as coping strategies, social behavioural expectations and the ‘culture’ adopted by

Table IV. Percentage distribution of non-acceptance of TMD-pain score 1 and 2 + 3.

TMD-pain score	Acceptance (%)	Non-acceptance (%)	
1	93.9	6.1	
2 + 3	44.8	55.2	<i>p</i> < 0.000

Table V. Mouth-opening capacity (mm).

	Male (<i>n</i> = 1345)	Female (<i>n</i> = 1492)	Total (<i>n</i> = 2837)
Mean	52.0	50.4	51.2
SD	7.145	20.862	15.927

healthcare institutions towards treating women [23,24] have been proposed, but no consensus has been achieved.

Is pain or dysfunction the main factor in disturbance of mandibular function? As an expression of disturbance in jaw function, we measured maximum mouth-opening capacity. Measuring with a ruler is valid and reliable for TMD [25]. The limit for good specificity (to identify healthy individuals) is 35 mm [25]. In healthy individuals, mouth-opening capacity varies between 45–53 mm and is 3 mm less in women than in men [26,27]. In our study, the mean opening-capacity was 51 mm. Individuals with less than 36 mm accepted this condition more readily than those with pain.

The term ‘acceptance’ is a subjective evaluation of a condition and consequences of a condition. It depends on a biopsychosocial framework, e.g. individual cognitive, affective and behavioural factors (importance for subjective wellbeing, worry, interference with daily living), evaluation of available resources (available health system, social support, coping styles) and results in help-seeking, self-care or avoidance [28]. Our aim in using this term was to include the patient’s perception of the level of intervention needed. To our knowledge the term has not previously been applied with reference to TMD-pain and dysfunction. Further research is needed in this area.

The total numbers of individuals included in different analyses varied as a result of internal attrition, faulty records and missing registrations in the clinical records system. For example, 1% of the individuals felt unable to accept their level of pain and dysfunction, even in cases of a TMD-pain score of 0. In six patients with a TMD-pain score of 1–3, their acceptance or non-acceptance of the condition was not registered.

The overall results of the study indicate that it is possible to implement these three steps at the clinical recall examination in general dental practice. For the future, the implementation of measures for detecting TMD-pain and the construction of a general care programme acceptable to both general practitioners and specialists is of great importance. In a public health strategy, continuing education has a key role for success as well as simple documentation in the records.

It is concluded that the TMD-pain score shows promise as a useful instrument in detection of the condition. The study disclosed a prevalence of TMD at a level high enough to constitute a public health problem. In cases of lower scores on the TMD-pain scale, most patients accepted their condition.

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References

- [1] Von Korff M, Dworkin SF, Le Resche L, Kruger A. An epidemiologic comparison of pain complaints. *Pain* 1988; 32:173–83.
- [2] Drangsholt ML. Temporomandibular disorder pain. In Crombie IK, editor. *Epidemiology of pain: a report of the Task Force on Epidemiology of the International Association for the Study of Pain*. Seattle, WA: IASP Press; 1999. p 203–33.
- [3] Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. *J Craniomandib Disord* 1992;6: 301–55.
- [4] Macfarlane TV, Glenny AM, Worthington HV. Systematic review of population-based epidemiological studies of orofacial pain. *J Dent* 2001;29:451–67.
- [5] Al-Jundi MA, John MT, Setz JM, Szentpétery A, Kuss O. Meta-analysis of treatment need for temporomandibular disorders in adult nonpatients. *J Orofac Pain* 2008;22:97–107.
- [6] Nilsson IM, List T, Drangsholt M. The reliability and validity of self-reported temporomandibular disorder pain in adolescents. *J Orofac Pain* 2006;20:138–44.
- [7] Atsu SS, Ayhan-Ardic F. Temporomandibular disorders seen in rheumatology practices: a review. *Rheumatol Int* 2006;26: 781–7.
- [8] Vincent A, Lahr BD, Wolfe F, Clauw DJ, Whipple MO, Oh TH, et al. Prevalence of fibromyalgia: a population-based study in Olmsted County, Minnesota, utilizing the Rochester Epidemiology project. *Arthritis Care Res* 2013;65:786–92.
- [9] Zarb GA, Carlsson GE. *Temporomandibular joint and masticatory muscle disorders*. Copenhagen: Munksgaard; 1994. p 539–40.
- [10] Laskin DM. Temporomandibular disorders: the past, present, and future. *Odontology* 2007;95:10–15.
- [11] Mejersjö C, Carlsson GE. Long-term results of treatment for temporomandibular joint pain-dysfunction. *J Prosthet Dent* 1983;49:809–15.
- [12] Dunn KM, Jordan KP, Mancl L, Drangsholt MT, Le Resche L. Trajectories of pain in adolescents: a prospective cohort study. *Pain* 2011;152:66–73.
- [13] Nilsson IM, List T, Drangsholt M. Prevalence of temporomandibular pain and subsequent dental treatment in Swedish adolescents. *J Orofac Pain* 2005;19:144–50.
- [14] Tegelberg A, Wenneberg B, List T. General practice dentists’ knowledge of temporomandibular disorders in children and adolescents. *Eur J Dent Educ* 2007;11:216–21.
- [15] List T, John MT, Dworkin SF, Svensson P. Recalibration improves inter-examiner reliability of TMD examination. *Acta Odontol Scand* 2006;64:146–52.
- [16] LeResche L, Mancl LA, Drangsholt MT, Saunders K, Korff MV. Relationship of pain and symptoms to pubertal development in adolescents. *Pain* 2005;118:201–9.
- [17] Tervonen T, Kuuttila M. Prevalence of signs and symptoms of mandibular dysfunction among adults aged 25, 35, 50 and 65 years in Osterbothnia, Finland. *J Oral Rehabil* 1988;15: 455–63.
- [18] Koch M, Eriksson HG, Axelsson S, Tegelberg A. Effect of educational intervention on adoption of new endodontic technology by general dental practitioners: a questionnaire survey. *Int Endod J* 2009;42:313–21.
- [19] Adérn B, List T, Nebeska M, Öster A, Tegelberg Å. Orsaker till remisser till bettfysiolog: en jämförelse mellan fyra specialistkliniker. *Tandläkartidningen* 2003;95:50–5.

- [20] Rezaei T, Ernberg M. Influence of oral contraceptives on endogenous pain control in healthy women. *Exp Brain Res* 2010;203:329–38.
- [21] Popescu A, LeResche L, Truelove EL, Drangsholt MT. Gender differences in pain modulation by diffuse noxious inhibitory controls: a systematic review. *Pain* 2010;150:309–18.
- [22] Stavropoulos F, Hastie BA. Chronic facial pain in the female patient: treatment updates. *Oral Maxillofac Surg Clin North Am* 2007;19:245–58, vii.
- [23] Shinal RM, Fillingim RB. Overview of orofacial pain: epidemiology and gender differences in orofacial pain. *Dent Clin North Am* 2007;51:1–18, v.
- [24] Leresche L. Defining gender disparities in pain management. *Clin Orthop Relat Res* 2011;469:1871–7.
- [25] Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. *J Craniomandib Disord* 1992;6:301–55.
- [26] Gross A, Gale EN. A prevalence study of the clinical signs associated with mandibular dysfunction. *J Am Dent Assoc* 1983;107:932–6.
- [27] Dworkin SF, Huggins KH, LeResche L, von Korff M, Howard J, Truelove E, et al. Epidemiology of signs and symptoms in temporomandibular disorders: clinical signs in cases and controls. *J Am Dent Assoc* 1990;120:273–81.
- [28] Kirana PS, Rosen R, Hatzichristou D. Subjective well-being as a determinant of individuals' responses to symptoms: a biopsychosocial perspective. *Int J Clin Pract* 2009;63:1435–45.