Psychosocial Functioning and Dental Factors in Adolescents with Temporomandibular Disorders: A Case-Control Study

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Aims: *To examine the influence of psychosocial functioning and dental factors in adolescents with temporomandibular disorders (TMD) versus healthy subjects.* **Methods:** *The TMD sample comprised 63 patients (21 boys and 42 girls, 33% and 67%, respectively, with a mean age of 14.9 years; range 12 to 18 years) and was compared with 64 healthy control subjects (17 boys and 47 girls, 27% and 73%, respectively, with a mean age of 14.8 years). Subjects in the TMD group had to report pain once a week or more and to have a TMD pain diagnosis according to the Research Diagnostic Criteria for TMD. Participants were clinically examined and filled out a questionnaire in which self-reported psychosocial functioning was assessed on standardized measures, including the Youth Self-Report (YSR), somatic complaints, and stress.* **Results:** *No significant differences were found in dental factors among adolescents in the TMD group compared with those in the control group. Multiple pains in the body and fatigue were significantly more common in the TMD group compared with the control group. Adolescents with TMD also reported significantly higher levels of stress, somatic complaints, and aggressive behavior than their counterparts in the control group. In particular, young adolescents with TMD reported high levels of psychosocial problems.* **Conclusion:** *In adolescents with TMD, psychosocial factors such as increased levels of stress, somatic complaints, and emotional problems seem to play a more prominent role than dental factors.*

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Key words: adolescence, bruxism, headache, psychological tests, temporomandibular disorders

Several epidemiologic studies have shown that temporomandibular disorders (TMD) are common among adolescents.[1] The most common TMD symptom reported for which patients seek treatment is pain involving the masticatory muscles, the temporomandibular joint (TMJ) and associated structures, or both.[2] In adolescents, the prevalence rates of TMD pain range from 0.7% to 7.0%.[3,4] In a Swedish population-based study of adolescents experiencing TMD-related pain once a week or more, greater consumption of analgesics and more absences from school were found.[4]

International investigations have found that the prevalence of recurrent headaches increased among adolescents from 1985 to 1996.[5] In epidemiologic studies, a high prevalence of tension-type headache (TTH) has been reported among individuals with TMD.[4,6] Research on background factors in children and adolescents with

recurrent headaches has focused on various psychosocial functioning and health behavior problems.[7,8] Furthermore, previous research indicates that children and adolescents with various types of long-standing pains are likely to develop emotional and psychologic difficulties.[9] It is therefore important that children and adolescents with recurrent pains should be carefully evaluated and offered effective treatment so that they do not suffer a diminished quality of life or develop long-term pain, emotional problems, or disabilities in adulthood.

Even though no clear causal relationship between TMD and a particular risk factor has yet been identified, several factors have been reported to be associated with TMD in adults and adolescents. In a review of studies based on mixed samples of adolescents and adults, McNamara et al[10] reported that some morphologic malocclusions could increase the risk of TMD. Katzberg et al[11] found that trauma was a common cause of TMD pain in a pediatric population, and Westling and Mattiasson[12] noted an association between general joint hypermobility and TMD in adolescents. Based on findings of a higher prevalence of TMD pain in girls than in boys following puberty, LeResche[3] suggested that female reproductive hormones may constitute a risk factor. Vanderas[13] reported a relationship between oral parafunctions and TMD in children and adolescents. In another study, Vanderas et al[14] found that urinary catecholamine levels in children were increased in bruxers compared with non-bruxers, suggesting that emotional stress might be a factor in the development of bruxing behavior. In the psychosocial domain, life stress, depression, and the presence of multiple somatic symptoms have been suggested to be other possible risk factors for TMD pain in adults.[15,16] Although such factors have been investigated in adolescents with TMD, empirical studies are rare.[17]

The aim of the present study was to examine the influence of various psychosocial functioning and dental factors in adolescents with TMD in comparison with healthy subjects.

Materials and Methods

Subjects

A total of 127 adolescents participated in the present study: 63 TMD pain patients (21 boys and 42 girls, 33% and 67%, respectively, with a mean age of 14.9 years) and 64 healthy control subjects (17 boys and 47 girls, 27% and 73%, respectively, with a mean age of 14.8 years). Subjects in the TMD group were 12 to 18 years old, experienced pain once a week or more, and had received a TMD pain diagnosis according to the Research Diagnostic Criteria (RDC/TMD).[18] The subjects in the control group were 12 to 18 years old; reported pain in the face, jaw, or head less than once a week; and had no TMD pain diagnosis.

Procedure

The 2 study samples were drawn from a total community sample of adolescents aged 12 to 18 years who were registered at a Public Dental Service clinic in Linköping, Sweden (1,008 individuals). These 1,008 individuals had been surveyed in a previous study.[4] The overall dropout rate in the survey was 17%. Sixty-three subjects (7%) were found to have TMD pain. Detailed descriptions of the TMD diagnoses (ie, myofascial pain, disc displacements, or arthralgia/arthritis/arthrosis) and TTH (episodic and chronic) as well as other characteristics (eg, pain intensity, frequency of pain, clinical signs, medicine consumption, and reported days of school absence) of these individuals were recently provided in an epidemiologic cross-sectional study.[4] These 63 individuals with TMD pain participated in the TMD group in this study. Subjects in the control group were group-matched with subjects in the TMD group to achieve a similar age and gender distribution (Table 1). The individuals in the control group were randomly selected by computer from the same community sample of adolescents as the TMD group.

All the participants filled out questionnaires before being clinically examined (see "Adolescent Report" section). The examiner was unaware of this information. A dental nurse was available to explain the questions, if necessary, and to check the questionnaires for completeness and legibility. A previous study established an acceptable reliability for several of the items in these questionnaires, for the clinical TMD examination, and for the diagnosis in children and adolescents.[19] A calibrated operator performed the clinical examination and was unaware of whether the participants were healthy controls or TMD patients.[19] The local Ethics Committee approved the study, and all subjects and their parents signed an informed, written consent.

Clinical Examination

RDC/TMD Examination. The following signs and symptoms were assessed: pain site; mandibular

Table 1 Sociodemographic Characteristics of TMD and Control Subjects

Variable	TMD group	Control group	*P* values
No. of subjects	63	64	NS
Gender			
Boys	21	17	NS
Girls	42	47	NS
Age			
Mean (years)	14.9	14.8	NS
Standard deviation	2.1	2.0	
Living with both parents (%)	62	72	NS
Parental socioeconomic status (%)			NS
High	6	2	
Medium	63	82	
Low	31	16	
Immigrant (adolescent or parent) (%)	18	16	NS

NS = not significant.

range of motion (mm) and associated pain (jaw opening pattern, unassisted opening without pain, maximum unassisted opening, maximum assisted opening, mandibular excursive and protrusive movements); TMJ sounds; and tenderness elicited by muscle and joint palpation. Based on the findings of the clinical examination, subjects were assigned RDC/TMD Axis I diagnoses as follows: Myofascial Pain; Disc Displacements; and/or Arthralgia, Arthritis, and Arthrosis.[4,18] A good reliability has been reported for the inter- and intraexaminer RDC/TMD diagnosis.[19]

Morphologic Examination of the Teeth. Space anomalies (spacing > 2 mm and/or crowding > 2 mm), post- and prenormal occlusion (> 1/2 cusp width at the first molar), maxillary overjet (> 6 mm), mandibular overjet (> 0 mm), deep bite (> 5 mm), open bite (< 0 mm), crossbite, scissors bite, and an occlusal slide (> 2 mm) were recorded.[20] A very good to excellent reproducibility has been reported for registration of occlusal and tooth relationships.[21]

Occlusal and Functional Examination of the Teeth. Number of teeth, number of occluding teeth, occlusal interferences (either lateral deviations of the mandible > 0.5 mm during slide from retruded contact position [RCP] to intercuspal position [IP] and/or a distance between RCP and IP > 2 mm), and articulation interference (interference on the mediotrusion side unilaterally or bilaterally) were recorded. According to the index score, the patients were classified into "No/moderate" or "Severe" functional disturbance categories.[22] The analyses were conducted with the aid of an occlusion foil (Arti-foil, Bausch, 0.008 mm). An acceptable reproducibility in recording RCP and IP and articulation interference has been reported.[23,24]

Joint Mobility. Each individual was graded by a hypermobility score ranging from 0 to 9[25]: passive dorsiflexion of the little finger beyond 90 degrees (1 point for each hand), passive apposition of the thumbs to the flexor aspects of the forearm (1 point for each thumb), hyperextension of the elbows beyond 10 degrees (1 point for each arm), hyperextension of the knees beyond 10 degrees (1 point for each knee), and forward flexion of the trunk with the knees fully extended so that the palms of the hands rest flat on the floor (1 point). Measurement of general joint mobility has been performed extensively in various populations, and normative data for the population has been presented.[26]

Questionnaires

Dental Self-Report Variables. The adolescents were asked 2 dichotomous (yes/no) questions: Have you been told or have you noticed that you grind or clench your teeth? Have you had a recent injury to your face or jaw? An acceptable reproducibility was found for these 2 questions in a previous study.[19]

Headache Classification. Tension-type headache was diagnosed according to the International Headache Society criteria and based on questionnaire information, which was checked during the interview.[27] The patients received a diagnosis of episodic TTH (ETH, TTH less than 15 days/month) or chronic TTH (CTH, TTH more than 15 days/month). Migraine was classified as either migraine with or migraine without aura.

Adolescent Report. The adolescents were asked to fill out questionnaires that had been used in previous studies of adolescent psychosocial functioning and covered the following areas[8,19,28]: demographic variables; various aspects of pain including parental pain, consumption of health care, and stress; and somatic complaints,[7,19] social competence, and emotional/behavioral problems.[28]

Demographic Variables. Subjects were classified according to whether or not they lived with both parents; the socioeconomic status of the family was rated based on parental occupation in accordance with the guidelines of Statistics Sweden.[29] When there were 2 parents in the family, the higher rating for parental occupation was used. The categories were then collapsed into the following 3-point scale: 1 = upper status (entrepreneurs,

lawyers, physicians, etc); 2 = middle status (civil servants, teachers, etc); 3 = lower status (unskilled and skilled workers). Immigration of the adolescent or parent to Sweden from another country was noted.

The adolescents rated their home and school satisfaction, their relationships with their peers, and their experience of school-related stress.[7,8,30] They also provided information on participation in physical education or exercise in their spare time (daily, several times a week, a few times a month, or almost never) and whether they had any special problems in school or with their friends. These measures had been used in a previous study of adolescents with recurrent headaches compared with headache-free controls.[7]

Pain. Subjects were asked about experienced causes of pain. They were also asked whether anybody else in the family had pain, and if so, whether pain occurred in the mother, the father, or a sibling. Visits during the previous month to the school nurse or physician because of pain, routine visits to a doctor or hospital, and whether the subject had any temporary or chronic illness or disability were also assessed. The frequency of pain, eg, headache or pain in the temples, face, TMJ, or jaws, was reported on a 5-point scale (never, 1 to 2 times a month, once a week, several times a week, or daily). Pain duration was reported in months.

Subjects were asked about school absences because of illness (once a week or more, a couple of times a month, once a month, once or twice each term, or almost never) and about the number of days in the last month they had spent at home because of pain in the face, TMJ, or jaws. In addition, they provided information on their use of analgesics because of pain (daily, 3 to 4 times a week, 1 to 2 times a week, once in a while, every month, and never or almost never). A very good reliability was found for these questions in a previous study.[19]

Somatic Complaints. The frequencies of 25 somatic complaints, including common pains, were rated by the adolescents on a 4-point scale (1 = never, 2 = seldom, 3 = often, 4 = always). This questionnaire had been used in a previous study of 539 adolescents aged 13 to 18 years[31] and in a study of adolescents with chronic headaches and healthy adolescents.[7,31]

Stress Score. The adolescents rated their experience of 10 common everyday life stressors on a 4-point scale (1 = never, 2 = seldom, 3 = often, 4 = always) and a total sum score was calculated for all items. The stress score and somatic complaint inventories had been used in previous studies of adolescents with recurrent headaches in comparison with headache-free adolescents and had been shown to have good discriminative validity.[7]

Youth Self-Report. The Youth Self-Report (YSR) is one of the most widely used measures for adolescent report of social competence and emotional/behavioral problems and was used in the present study.[28] The YSR consists of 11 social competence items subdivided into 3 areas—activities, social, and academic—and the sum scores in these areas yield a total social competence score. The adolescents were also asked to rate 103 behavioral/emotional problems on a 3-point scale (0 = not true, 1 = somewhat or sometimes true, 2 = very true or often true) for the previous 6 months. The behavioral problem scores can be divided into 2 broad dimensions: internalizing and externalizing categories, which form a total behavioral problem score (excluding the socially desirable items 2, 4, and 16). The internalizing scale consists of 3 subscales—withdrawn, somatic complaints, and anxious/depressed syndromes—and the externalizing scale consists of the delinquent and aggression syndromes. Another unspecified category includes thought. Social and attention problems and items not belonging to any scale are grouped under the "other problems" category. The guidelines recommended by Achenbach[28] were followed. The instrument has been used internationally in numerous studies of normative and various clinical populations. Reliability and validity of the YSR have been found to be good.[28] Swedish norms were recently gathered on 2,522 adolescents aged 13 to 18 years, including some in the city of Linköping and the surrounding area, in which the present study was conducted.[32] The present TMD sample was subdivided into younger (12 to 14 years) and older adolescents (15 to 19 years), based on the median age value of the group in the analysis of the total YSR score.

Statistical Methods

Independent *t* tests were used to analyze between-group differences for continuous variables and Mann-Whitney tests were used for ordinal variables. Chi-square tests were used for assessing associations between categorical variables. An alpha level of $P < .05$ was used to indicate statistical significance. To protect against inflated estimates of alpha levels due to multiple comparisons, Bonferroni sequential corrections were used.

Table 2 Results of the Clinical Examination and Adolescent Report of Dental Problems

Variable	TMD group (%)	Control group (%)	*P* values
Clinical examination			
No. of occluding teeth (2–15 occluding teeth)	8	5	NS
Large overjet	13	6	NS
Open bite	10	2	NS
Deep bite	0	5	NS
Unilateral posterior crossbite	0	2	NS
Occlusal slide > 2 mm	11	14	NS
Articulation interference (interference on the mediotrusion side)	19	23	NS
General joint hypermobility	6	17	NS
Self-report			
Clenching and/or grinding of the teeth	38	21	NS
Trauma to the jaw or face	8	5	NS

NS = not significant.

Results

The distribution of the demographic variables is shown in Table 1. No significant differences were found between the TMD and control groups. For subjects in the TMD group, the mean duration of pain in the temporal area was 24.3 months (SD 19.1) and that in the face or jaws was 9.4 months (SD 15.0).

Home and School Satisfaction, Peer Relationships, Leisure Time Activities

Adolescents with TMD reported significantly ($P < .01$) lower satisfaction during school lectures than those in the control group. No significant difference was found between the groups in satisfaction with home life, sports activities, or reports of parental pain.

Clinical and Dental Self-Report Variables

No significant difference was found for the number of occluding teeth, morphologic malocclusions, occlusal interferences, articulation interferences, clinically measured joint hypermobility, or reports of trauma (Table 2). Clenching and/or grinding of the teeth was reported more often by adolescents in the TMD group than by adolescents in the control group, but no significant differences between the groups were found.

Pain

Pain localized in the back, arms and legs, and head was reported significantly more frequently among adolescents in the TMD group than among adolescents in the control group (Table 3). No difference was found for abdominal pain. In the TMD group, ETH was significantly more common than among control subjects (59% and 34%, respectively); CTH was also significantly more common among TMD patients (38% versus 0%). Both these types of headaches, when collapsed into a single TTH category, were significantly more common among TMD patients than control subjects (95% and 34%, respectively). Three adolescents, 2 in the control group and 1 in the TMD group, regularly experienced migraine headaches (2.4%).

As a consequence of the pain, TMD subjects had sought help more frequently from school nurses and physicians and consumed more analgesics because of headache than did the control subjects (Table 4). In absences from school because of TMD pain or headache, no significant difference was seen between the groups. No differences between the groups were found in the number of regular visits to a physician/hospital or in school absences resulting from temporary or chronic illness or the presence of a disability.

Stress Score and Somatic Complaints

The mean levels of total stress and fatigue were significantly higher in the TMD subjects than in the control subjects (Tables 3 and 5).

Youth Self-Report

In rating social competence, only the items on the social and academic performance scales were analyzed. The results showed that the peer relationships reported by the control adolescents were significantly better than those reported by the TMD adolescents. The levels of somatic complaints and aggressive behavior problems were significantly higher for the TMD than for the control adolescents. Similarly, significant differences were also found for internalizing and externalizing syndromes, as well as for the YSR total mean score. Younger subjects (12 to 14 years) had significantly higher total YSR scores ($P < .01$) than older subjects (15 to 19 years) (mean = 55.6 ± 27.3 and 42.0 ± 23.3, respectively).

Discussion

In the present study, a sample of adolescents with TMD pain comprising 7% of all adolescents registered in a Public Dental Service catchment area was compared with a sample of healthy subjects without TMD pain.[4] The 2 groups did not differ from each other in demographic characteristics, thus strengthening the representativeness and generalizability of the results of the study.

In epidemiologic studies, bruxism is frequently reported as common among TMD patients.[33,34] Associations between parafunctional habits, reported symptoms, and clinical findings have

Table 3 Somatic Symptoms Among Subjects

Symptom type	TMD group (%)	Control group (%)	*P* values
Stomach pain	21	12	NS
Back pain	27	5	< .01
Pain in the arms and legs	18	2	< .05
Tension headache (episodic and chronic)	95	34	< .01
Fatigue	62	34	< .05
Sleep difficulties	25	14	NS
Illness or disability	17	11	NS

NS = not significant.

Table 4 Consequences of Pain for Subjects

Variable	TMD group (%)	Control group (%)	*P* values
Doctor visits because of pain	31	3.2	< .01
Nurse visits because of pain	41	14.5	< .05
Routine doctor checkups	14	5	NS
Analgesic consumption	33	0	< .01
School absence because of pain	15	3	NS
Frequent school absence because of illness	28	21	NS

NS = not significant.

Table 5 Mean Values for Stress, Various Subscales, Syndromes, and Total Behavior Problems of the Youth Self-Report

Variable	TMD group (mean and SD)	Control group (mean and SD)	*P* values
Total stress score	20.5 (5.0)	16.9 (3.9)	< .001
Youth Self-Report			
Withdrawal	3.4 (2.7)	2.7 (1.9)	NS
Somatic complaints	4.9 (3.1)	2.0 (1.8)	< .001
Anxious/depressed	6.8 (6.2)	4.4 (4.3)	NS
Delinquent behavior	3.7 (2.7)	2.9 (2.2)	NS
Social problems	2.2 (2.2)	1.4 (1.5)	NS
Thought problems	2.3 (2.6)	1.5 (1.8)	NS
Attention problems	5.6 (3.4)	4.5 (2.9)	NS
Aggressive behavior	9.2 (4.8)	7.1 (3.7)	< .05
Internalizing	14.8 (10.2)	8.2 (5.1)	< .01
Externalizing	12.9 (6.8)	10.0 (4.9)	< .05
Total behavior problems	48.0 (25.8)	30.7 (14.4)	< .05

been noticed,[35] along with associations between oral habits and frequency of headache.[36] Bruxism has been suggested to reflect hyperactivity in the masticatory muscles and to perpetuate TMD.[2] In our study, a higher but non-significant rate of bruxism (tooth clenching and/or grinding) was reported by the adolescents with TMD (38%) than by those in the control group (21%), indicating that such a condition is fairly common in young people. However, limitations of self-reporting of bruxism have been pointed out,[37] and the importance of using direct measures, eg, electromyographic (EMG) activity in sleep laboratories or observations by significant others, has been emphasized.[38]

Trauma, eg, extensive stretching of the jaw, prolonged mouth opening during dental procedures (for extractions of teeth or cementing of crowns), oral intubation for the administration of general anesthesia, sports injuries, and cervical extension-flexion injuries (whiplash), has been suggested to be an etiologic factor for TMD in the population.[2] For example, differences in prevalence rates have been reported in adult patient and nonpatient populations.[39] Katzberg et al[11] reported that trauma caused TMD pain in 26% of a pediatric population. In our study, however, no significant difference between the TMD and control groups was found in reports of previous trauma. A significantly higher prevalence of trauma in boys than girls in a TMD sample has been reported previously.[4,12,34] Unruh[40] reported that men have approximately 50% to 60% more injuries than women and suggested that this difference might also lead to different pain experiences between the genders. In the present study, no gender difference was found.

An increased prevalence of disc displacements of the TMJ has been found in individuals with high general mobility scores. Temporomandibular disorders have also been reported to be significantly more common in patients with generalized joint laxity,[25] but in the present study, no such difference was found between the 2 groups. It should be noted that the frequency of joint laxity in our study was lower than that reported by others.[12]

In numerous studies, the association between morphologic and functional occlusal problems in TMD patients has been investigated (see, for example, McNamara et al[10]). However, the outcomes are conflicting, in that some evidence of such an association has been reported,[41] whereas other researchers have found no such evidence.[42] In the present study, the distribution of morphologic malocclusion was similar to that seen in a population-based study.[43] Although open bite was the only morphologic dental variable in which TMD adolescents had a higher frequency than control subjects, this difference was small (10% and 2%, respectively). In a study of an age-mixed sample of adolescents and adults,[10] the results of a multivariate analysis showed that the most common occlusal factors associated with TMD were anterior open bite, overjet greater than 6 to 7 mm, RCP/ICP occlusal slides, unilateral maxillary lingual crossbite, and missing posterior teeth. However, the relative risk was low, and 10% to 20% of the TMD patients could be correctly classified by their occlusal status.[10]

If an adolescent reports 1 type of pain, there is an increased risk that the same individual will also report other pains.[8] Multiple pains located in the neck, shoulders, or back of the head have been reported by adolescents with recurrent headaches.[44] In a previous Swedish study, 19% of the individuals reported both back pain and headache.[45] In the present study, ETH and CTH, backache, and pain in the arms and legs were significantly more common among adolescents in the TMD group than among adolescents in the control group. However, no differences were found for abdominal pain or migraine headache. Abdominal pain is more common in preadolescent children,[1] and migraine is not likely to be associated with increased muscle tension to the same degree as is TTH. The mean total sum score for somatic complaints in our study (eg, dizziness, being overtired, aches or pains, nausea, problems with eyes, and stomachaches) was significantly higher in the TMD group than in the control group; this has also been observed among adolescents with recurrent headaches.[7,8] It has been suggested that an increase in somatic symptoms might either be a reaction to stressors[8] or reflect a somatization disorder.[46]

Pain complaints have been found to be common in parents of children and adolescents with recurrent headaches or abdominal pain.[7,47] In particular, more frequent headaches have been reported by mothers of schoolchildren with recurrent unspecified as well as migraine headaches.[48,49] By contrast, in the present study no difference in parental pain was found between the TMD and control groups.

In several controlled studies, children and adolescents with recurrent abdominal and head pain have been found to have increased levels of overall maladjustment, other somatic symptoms, and more depression and anxiety than pain-free control subjects.[7,8,47] Thus, the overall findings of the present

study are consistent with those of previous reports and show that adolescents with TMD have more pain and other somatic complaints (besides headaches), experience more stress, and report more anxiety, depression, and aggressive behavior. In a previous Swedish study, adolescents with TMD also reported increased anxiety and nervousness.[17]

Of particular interest is that subjects in the TMD group had significantly higher stress scores than subjects in the control group. In addition, significant correlations between reports of "feeling tense" and signs and symptoms of TMD have also been shown.[17] It has been suggested that psychologic factors such as stress affect peripheral mechanisms as well as mechanisms within the central nervous system.[3] For example, stress has been shown to increase masseter muscle tension levels in myofascial pain patients with TMD[50] and to release certain neurotransmitters (eg, norepinephrine and serotonin) that are involved in pain and depression.[51] Various somatic symptoms, including pain, have been related to daily stress at home or in school.[45] Stressful life events, eg, parental divorce or separation, have been associated with recurrent headaches in adolescents.[7] In the present study, however, similar levels of satisfaction with home conditions were reported by adolescents in the TMD and control groups, supporting the results of previous studies.[8] Overall, higher levels of somatic complaints have been reported by adolescent girls who have a lower amount of school satisfaction.[29] School problems, such as experience of stress[48] and bullying, have been associated with recurrent headache.[49] In the present study, lower levels of satisfaction during school lectures were reported by the adolescents in the TMD group. Brattberg and Wickman[49] reported a weak relationship between headache and sports activities during leisure time, but no such relationship was noted in our study or by others.[7,8]

The behavioral consequences of recurrent pains in children and adolescents are (in addition to subjective personal discomfort) reflected in higher rates of school absence and medication usage and in a reduction in several everyday life activities.[1,7] Headache has been found to be 1 of the main reasons for children and adolescents to visit the school nurse.[45] In our study, the majority of the adolescents with TMD reported that their pain did not limit their daily activities to any considerable extent. Although the TMD subjects were absent from school more often (once a month or more due to pain) than those in the control group, this difference was not significant. About one third of the TMD subjects reported the use of analgesics once a week or more, compared to no subjects in the control group. The frequency of medicine consumption among the adolescents in this study was higher than that seen in reports by others.[34] Adolescents in the TMD group had also visited the school nurse or physician significantly more often than those in the control group, which is in accordance with results from studies of adolescent headache sufferers.[7] However, several TMD subjects in the present sample reported that their pain had an impact on their lives. This impact is likely to be even more pronounced in subjects recruited from a TMD clinic specialist center than among cases from a public dental community clinic.[19]

The YSR, used in the present study to measure social competence and emotional/behavioral problems in adolescents, has been normalized on Swedish adolescents.[32] Although the total mean problem levels for the TMD group were comparable to a normative sample, the control subjects had fewer problems than the TMD subjects. In particular, younger adolescent girls and boys with TMD had even higher total problem scores, suggesting that the psychosocial consequences of their disorder were stronger for these individuals. The finding that a pain-free control group showed lower levels of psychosocial problems than subjects in a normative sample is consistent with the findings of a previous study of adolescent headache sufferers.[31]

Some limitations in the present study need to be pointed out. For several of the measures in this study, ie, inventories of stress and somatic complaints, self-reports of bruxism and trauma, functional examination of the teeth, and joint mobility, limited data on reliability and validity have been presented. For these measures, only 1 source of information was used—ie, only the adolescents' reports of their psychosocial functioning. Given the low correlation between various informants, for instance, between parents and adolescents for various problems,[52] complementing this information with parental reports would have yielded a more comprehensive picture of psychosocial functioning in the adolescents. Further, the global reports of pain could have been supplemented with a diary in which adolescents assessed various types of pain.

An association between TTH and TMD has been reported in epidemiologic studies.[4,6] Pain localized to the masseter and the temporalis region has been reported following experimentally induced bruxism.[53] Anatomically, the temporalis muscle, a powerful elevator of the mandible, is located in the region where both TMD and headaches are

reported to occur. According to the RDC/TMD criteria, subjects who report pain in the temples and exhibit pain upon palpation of the masticatory muscles merit a TMD diagnosis (myofascial pain). Episodic tension headache and CTH were found to be common and often to coexist with TMD pain. For a long time, increased postural EMG activity has been believed to play an important role in the pathophysiology of many musculoskeletal pain disorders, including persistent jaw muscle pain and TTH. Some studies have indicated no significant difference in postural EMG activity,[54] while others have found a small increase[55] or a small decrease.[56] The same controversy is present in tension headache; some studies have reported significant increases in pericranial surface EMG activity,[57,58] whereas others have found no significant increases or relationships to pain.[59,60] There is no consensus on the surface EMG activity in the masticatory muscles in TMD pain, and the methodology of several studies of surface EMG activity has been criticized.[61] Even though the pathophysiologic process in TMD pain is unclear, the strong relationship between any type of TTH (95%) and TMD among adolescents in the present study suggests that similar mechanisms might be at work behind the 2 pain disorders.

The outcome of this study shows that psychosocial factors such as increased levels of stress, somatic complaints, and emotional problems play a more important role in TMD than dental factors. Due to limitations in the design of the present study, it is not possible to draw any conclusions about causal relationships between psychosocial factors and various pains among the adolescents surveyed. To examine such relationships, a longitudinal study needs to be carried out.

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