

# Prevalence of Temporomandibular Pain and Subsequent Dental Treatment in Swedish Adolescents

**Ing-Marie Nilsson, DDS, MDS**  
Research Student  
Public Dental Service  
Skarptorp, Norrköping, Sweden

**Thomas List, DDS, Dr Odont**  
Associate Professor  
Orofacial Pain Unit  
University of Malmö  
Malmö, Sweden

**Mark Drangsholt, DDS, MPH**  
Associate Professor  
Oral Medicine  
Dental Public Health Sciences  
University of Washington  
Seattle, Washington

**Correspondence to:**

Dr Thomas List  
Orofacial Pain Unit  
Department of Stomatognathic  
Physiology  
Faculty of Odontology  
Malmö University  
SE-205 06 Malmö, Sweden  
Fax: +46 40 6658420  
Email: Thomas.List@od.mah.se

***Aims:** To assess the prevalence of temporomandibular disorder (TMD) pain in Swedish adolescents, to evaluate whether there are differences in TMD pain in regard to age, gender, and place of residence (urban or rural), and to evaluate treatment for TMD pain and compare it with documented treatment for teeth with caries. **Methods:** All youths aged 12 to 19 years in Östergötland County were eligible to participate in the investigation, which took place at public dental clinics during annual examinations in 2000. The subjects were asked 2 questions: (1) "Do you have pain in your temples, face, jaw joint, or jaws once a week or more?" and (2) "Do you have pain when you open your mouth wide or chew once a week or more?" Two hundred dental records of patients with TMD pain and 100 records of patients with documented caries were randomly selected from the population. These records were used to compare the treatment of TMD pain to the treatment of caries. **Results:** Among the 28,899 youths participating, 4.2% reported TMD pain. The prevalence increased with age, and a significant difference was seen between boys (2.7%) and girls (6.0%) ( $P < .001$ ). In 43% of the patients with TMD pain, the TMD condition was noted in the record. TMD-related treatment was given to 34% of patients with TMD pain in dental clinics, whereas 100% of the patients with caries received restorative treatment. The most common treatment modalities for the TMD group were occlusal splints and information about TMD. **Conclusion:** The prevalence of self-reported TMD pain was relatively low, increased with age, and was higher among girls than boys. One third of the patients with TMD pain received some form of TMD treatment in the dental clinics. J OROFAC PAIN 2005;19:144-150*

**Key words:** adolescents, gender, pain management, prevalence, temporomandibular disorders

Like caries, trauma, and orthodontic malocclusions, temporomandibular disorders (TMD) and facial pain are common orofacial conditions among adolescents.<sup>1-4</sup> One systematic review found that the prevalence of self-reported TMD pain among children and adolescents varied between 0.7% and 18.6%.<sup>5</sup> This range in prevalence might be related to factors such as the structure of the population and how questions about pain were asked.

One method of measuring the frequency of pain conditions (such as headache) and their potential clinical relevance is to ask a person whether they have pain "once a week or more."<sup>6</sup> This short time frame was used in an investigation of 12- to 18-year-olds from Östergötland County, Sweden, the same region and age group studied in the present investigation. In that study, a prevalence of 7.3% was reported for TMD pain once a week or more.<sup>4</sup>

TMD pain was more common among girls than boys. Because of the pain, more than 20% of the TMD subjects consumed analgesics each week, and 20% were absent from school at least 1 day per month.<sup>4</sup>

Several studies have found that half of those with TMD pain have a subjective treatment need, which corresponds to approximately 3% to 5% of the population.<sup>4,7</sup> However, another study found that only approximately 1% of children and adolescents in the Swedish Public Dental Service (PDS) receive treatment for TMD.<sup>8</sup>

Few clinical studies have evaluated TMD treatment of adolescents, but the available research shows that a majority of these individuals respond well to conservative treatment.<sup>9,10</sup> Besides the provision of information about the condition, treatment with occlusal splints is the most common therapy given for TMD pain in the PDS in Sweden among adolescents.<sup>8,11</sup>

In Sweden, dental care is free of charge from 0 to 19 years, and all children and adolescents are regularly examined at individually adapted intervals. Epidemiologic investigations of caries-related variables have been performed as part of the clinical routine for some time.<sup>12</sup> The epidemiologic variables vary by county but primarily target caries. The definition of dental caries was uniform in Sweden when these data, which are collected annually by the National Board of Health and Welfare in Sweden [Socialstyrelsen], were registered.<sup>12</sup>

Because TMD pain occurs frequently, the PDS in Östergötland County introduced a new epidemiologic variable, temporomandibular disorders and pain (TMD-pain or TMD-smärta), to be recorded at the annual routine examination. Since 2000, TMD pain has been recorded for all children and adolescents between the ages of 12 and 19 years. The intention of this initiative is to continuously follow the development of pain in the masticatory system and to systematically detect individuals with pain and offer them care. Early discovery of pain may be important in prevention of the development of a more chronic condition.<sup>8,13</sup>

Many studies of children and adolescents with TMD are based on a limited or selected population. Here, screening of a large population-based study was used to broaden our knowledge of TMD prevalence and subsequent treatment among adolescents.

The main hypotheses were that TMD pain is more prevalent among girls than boys and increases with age and that the majority of those with TMD pain received some form of interven-

tion. The purpose of this investigation was 3-fold: to assess the prevalence of temporomandibular disorder (TMD) pain in Swedish adolescents, to evaluate whether there are differences in TMD pain in regard to age, gender, and place of residence (urban or rural), and to evaluate treatment for TMD pain and compare it with documented treatment for teeth with caries.

## Materials and Methods

### Participants

In 2000, the population of Östergötland County in Sweden was 411,345 individuals. Of these, 39,711 were 12 to 19 years old. A total of 29,965 adolescents between the ages of 12 and 19 years were seen at a routine annual examination in 2000. All 35 PDS clinics participated. Of the 9,746 adolescents who were not examined, private dental practitioners treated 3,119 (7.9%). The remaining 6,627 were not seen because they were not scheduled for their examinations. Of the 29,965 examined, data for 1,066 were unavailable, leaving complete data on 28,899 adolescents or 72.8% of the population.

The study was approved by the ethics committee of the Faculty of Health Sciences of Linköping University.

### Design

When the epidemiological variable TMD-smärta (TMD pain) was introduced, all PDS personnel were informed via internal television about the background for this change in the procedure and were instructed how to question the patient and perform the interview and examination. These instructions were later supplemented with written information to all clinics and new oral reviews at each clinical practice. All consecutive PDS patients between the ages of 12 and 19 years who were examined during 2000 were registered for the variable TMD pain and the number of teeth with caries.

To evaluate whether the recording of TMD pain or teeth with caries led to any treatment, dental records were abstracted. Two hundred dental records of 12- to 18-year-old patients with TMD pain and 100 records belonging to patients with teeth with caries were randomly selected from the population. A systematic evaluation of the charts was made and the following variables were recorded:



Fig 1 The figure shows how each therapist demonstrated the localization of TMD pain to adolescent subjects.

- **TMD pain registration:**
  - TMD pain
  - Maximum jaw opening (mm)
  - Notes concerning history of TMD and pain
- **Clinical measures:**
  - Referral to a TMD specialist
  - Evidence of contact with a school nurse, doctor, orthodontist, or other health professional regarding TMD pain
- **TMD treatment:**
  - Information provided to the patient about the usual nonprogressive course of TMD
  - Self-care instructions such as decreasing oral parafunction and resting the jaw
  - The use of a soft occlusal splint, hard occlusal splint, occlusal equilibration, jaw exercises, acupuncture, transcutaneous electrical nerve stimulation, mobilization, psychological treatment (biofeedback), or relaxation treatment
- **Cariou teeth registration:**
  - The number and type of carious teeth
  - Treatment measures such as restorations or fluoride treatment

All adolescents in the region who were recorded as having TMD pain in the registration were included in the automated data analysis (n = 1,223). The county computer system was used to evaluate whether an occlusal splint had been given to the patient. This procedure was the only TMD treatment that it was possible to retrieve from the computer system.

**Variables**

**TMD Pain.** All adolescents between 12 and 19 years of age were asked 2 questions to ascertain whether they had ambient or functional jaw pain: (1) “Do you have pain in the temple, face, tem-

poromandibular joint, or jaws once a week or more?” and (2) “Do you have pain when you open your mouth wide or chew once a week or more?” To facilitate comprehension, the therapist pointed to the anatomic regions mentioned so that the patient would better understand the question (Fig 1). If the patient answered yes to 1 or both of the questions, TMD pain was registered as “1.” If the patient answered no, TMD pain was registered as “0.” The questions were found to have excellent reliability in a previous study,<sup>14</sup> with kappa values of 0.92 and 0.81.

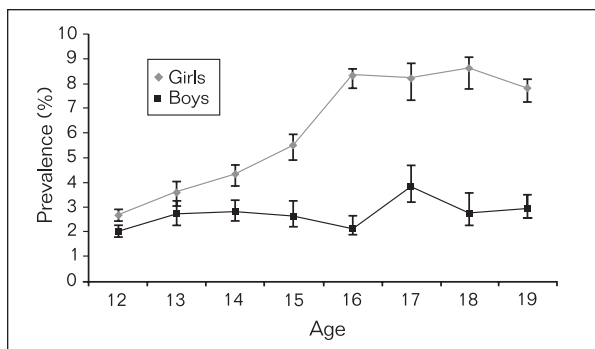
**Cariou Teeth.** The number of permanent teeth, filled and unfilled, with active manifest caries or secondary caries was recorded.<sup>13</sup>

**Statistical Methods**

Descriptive statistics and 95% confidence intervals for the proportion with TMD pain were calculated. For comparisons of categorical variables such as gender and place of residence, the chi-square test was used. For comparisons of continuous variables, the *t* test was used. The chi-square test for trend was used to evaluate the relationship between age and proportion with TMD pain by gender. The level of significance was set at *P* < .05. The data were analyzed with the statistical program SPSS.

**Results**

A total of 28,899 teenagers, 47.9% of whom were girls and 52.1% of whom were boys, participated in this study. The overall prevalence of TMD pain in Östergötland County 12- to 19-year-olds was 4.2%. The prevalences for individual clinics ranged from 1.2% to 8.1% among clinics. Prevalence was significantly higher among girls than among boys



**Fig 2** Prevalence of TMD pain in adolescents. The prevalence significantly increased with age for girls, while the increase for boys was less marked. The bars indicate 95% confidence intervals.

(6.0% vs 2.7%;  $P < .001$ ). Among girls, prevalence increased significantly ( $P < .001$ ) from 2.7% at age 12 to 7.9% at age 19 among girls. Prevalence also increased significantly among boys, from 2.0% at age 12 to 2.9% at age 19 ( $P = .035$ ; Fig 2). The PDS clinic in Ryd had a prevalence of 6.6%, which was significantly higher than the average ( $P < .001$ ). The county is divided into 3 regions—eastern, central, and western—and the prevalence, 4.2%, was identical in each of these regions. Prevalence was significantly higher in the cities than in rural areas (4.4% vs 3.9%;  $P < .05$ ).

Analysis of dental records to study the treatment given for TMD and caries was made the year after the initial examination. When the records of the TMD pain patients were reviewed, 24 of the 200 (12%) records were not used. In these cases, either the record of TMD pain in the chart was incorrectly entered into the computer database ( $n = 12$ ), the patient had moved and the record was missing ( $n = 3$ ), or the copy of the record was missing ( $n = 9$ ). The rate of missing data in the caries treatment group was 13% (13 patients). In these cases, either the registrations in the case book or the computer system were incorrect ( $n = 8$ ), the patient had moved and the record was missing ( $n = 3$ ), or the copy of the record was missing ( $n = 2$ ).

Notes on TMD pain were found in 76 of 176 (43%) of the randomly selected dental records of patients in the TMD pain group, and jaw-opening ability was registered in 81% of the patients. Some form of treatment had been given to 51 (29.0%) of these subjects at the PDS clinic. In addition, 8 (4.5%) had been referred to a TMD clinic for treatment. The interventions performed were occlusal splint (11.9%), information (10.2%),

**Table 1** Treatment for TMD Received by Adolescent Patients in the PDS

Treatment	Patients n (%)
Occlusal splint	21 (11.9)
Information about TMD	18 (10.2)
Orthodontic consultation	16 (9.1)
Jaw exercises	10 (5.7)
Occlusal equilibration	3 (1.7)
Relaxation training	2 (1.1)
<b>All types of treatment</b>	<b>51 (29.0)</b>

orthodontic consultation (9.1%), exercise (5.7%), occlusal equilibration (1.7%), and relaxation treatment (1.1%) (Table 1). Of the 8 patients (4.5%) referred to a specialist clinic (Public Dental Specialist Service [PDSS]) all were given information about TMD, 5 were given an occlusal splint, 2 received psychological treatment (visual feedback/biofeedback), 1 received relaxation therapy, and 1 was referred to a physiotherapist. The same patient may have received more than 1 treatment. A follow-up of the pain where no initial treatment was given was recorded for 4% of the patients. Apart from the treatment given, the school nurse or doctor was contacted in 3.4% of the cases. An orthodontist was consulted in 9.1% of the cases.

In total, 34% of the TMD pain patients received some form of treatment at either a PDS clinic or in the PDSS. Of patients with carious teeth, 100% received restorations and 48% received fluoride treatment.

## Discussion

To the authors' knowledge, this is the largest population-based prevalence study of TMD pain published to date. The study sample comprised 28,899 teenagers from 1 defined region in Sweden. The ratio between the sexes in the present study closely corresponds to the national average (Statistics Sweden's population statistics). The individuals who were screened constituted 72.8% of all adolescents in their age group in Östergötland County, and they did not differ from the remaining 27% by age or sex. The proportion of subjects not examined was relatively low, similar to other epidemio-

logical studies,<sup>4,15,16</sup> and the reason for not being examined was unrelated to the presence or absence of facial pain. The population may be regarded as generally representative of Swedish adolescents.

TMD comprises a variety of symptoms and clinical findings.<sup>17</sup> Several of these symptoms, such as clicking and/or popping of the temporomandibular joint, usually do not lead to serious sequelae such that TMD treatment becomes necessary.<sup>18</sup> TMD pain is, on the other hand, the most common reason for seeking care.<sup>19</sup> To determine the clinical relevance of the frequency of pain, the term "once a week or more" has been used in studies on both tension-type headache<sup>14,20,21</sup> and TMD.<sup>6,14</sup> The reliability of the framing of the question has been found to improve when the time limit is short and distinct.<sup>6,14</sup> If the limitation is set at this level for TMD pain, 1 study found that a little more than 50% of subjects reporting pain also reported a need for TMD treatment.<sup>4</sup>

The screening question that was used concerning ambient or spontaneous pain is based on the diagnostic criteria in the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD).<sup>22</sup> This question was supplemented with a question about functional pain (upon jaw movement), which is used in both the RDC/TMD and American Academy of Orofacial Pain classifications.<sup>17,22</sup> Both the questions were shown to have excellent test-retest reliability in a previous study of teenagers.<sup>14</sup>

Self-reported facial pain does not necessarily correspond to a TMD diagnosis. A diagnosis of TMD pain requires the report of pain and an examination finding of pain upon palpation in the masticatory system.<sup>17,22</sup> However, the authors performed a validation study of 60 adolescents with TMD pain and 60 individuals without TMD pain (although patients in the latter group could have other pain conditions). After an initial examination, patients were re-examined, and a clinical examination was completed by an examiner blind to the patient's self-report of pain symptoms. The clinical examination was based upon the RDC/TMD. The data showed that self-report of TMD pain agreed well with a TMD diagnosis according to RDC/TMD, with a sensitivity of 98% and a specificity of 90%.<sup>23</sup> Thus, it is likely that the vast majority of our subjects would meet RDC/TMD criteria for a diagnosis of TMD.

The prevalence of 4.2% found in the present study agrees well with the prevalences found in other investigations; prevalences for TMD pain of 2% and 7% have been reported in previous studies.<sup>4,5</sup> One reason for this variability may be

how the questions were administered, ie, via a mailed questionnaire, over the telephone, or in person. In addition, the time frame in which the patient is asked to describe his or her pain experience varies between studies and is likely an important determinant.<sup>5</sup>

In a previous study, a prevalence of 7% was found at a PDS clinic in Ryd in Östergötland County. In the present study, the same clinic had a higher prevalence than the average in the region. This probably explains the somewhat higher value from the previous study.<sup>4</sup>

An additional factor for the higher prevalence could be differences in methodology. Adolescents in the previous study filled in a detailed questionnaire, while the participants in this study were only asked 2 oral questions. In 1 study of TMD pain in youths, the prevalence of pain was 3% for children between the ages of 7 and 14 years, while 4% of 15- to 17-year-olds reported pain in the face more than once a week.<sup>15,24</sup> This agrees well with the prevalence reported in 2 other Scandinavian studies.<sup>5,25</sup> One study<sup>16</sup> found that 2.5% of 17-year-olds had pain and the other, a Finnish investigation,<sup>25</sup> found that 3% of the 10- to 16-year-old subjects had pain. These Scandinavian studies indicate fairly consistent data on prevalence in youths, which also does not appear to differ from the prevalence reported in other international studies in youths.<sup>5</sup>

Most studies have found that pain is generally more common among girls than boys.<sup>26</sup> In the present study, girls exhibited a higher prevalence of TMD pain than boys, which agrees well with previously reported studies.<sup>4,27</sup> These differences between the sexes are more distinct in clinic-based studies than in population studies.<sup>4,9</sup> This is probably because girls seek care more often than boys.<sup>26</sup>

Overall TMD pain increased more than 3-fold with age for girls. There was also a slight increase with age among boys; however, the increase was more marked among girls. This finding is in agreement with other studies.<sup>4,26</sup> The largest change took place between 15 and 16 years in girls, where the prevalence increased from 5.5% to 8.3%.

A small difference in TMD prevalence between city and country residences was also found. No other studies on TMD that have studied these differences were found. However, the results were in agreement with results from a Finnish study that found that headache is significantly more common in urban populations than in rural ones.<sup>28</sup>

How do these descriptive epidemiological findings correspond to purported TMD risk factors? Endogenous estrogen, occlusal factors, and emo-

tional and psychological factors have all been implicated in TMD. The dominance of girls has been the impetus behind some studies on the association between pain and female hormones such as estrogen.<sup>22,29</sup> Several investigations have demonstrated that estrogen interacts at the receptor level in both the peripheral and central nervous systems.<sup>22,29</sup> The average age for beginning menstruation is 12.9 years (Caucasian girls).<sup>30</sup> The phase shift between 12.9 years and the largest increase in pain in the present study, which occurred 2 years later at approximately 15 years of age, is difficult to explain by only hormonal factors, unless there is a 2-year lag time between these events.

Occlusal factors have been proposed to be a risk factor for TMD pain.<sup>31</sup> However, the lowest prevalence of pain in the present study was reported by subjects with late mixed dentition, when occlusion is most unstable. In addition, occlusal deviations occur in largely the same proportions between the sexes, so occlusal factors would not explain the predominance of TMD pain among girls.<sup>32</sup>

Emotional and psychological factors such as stress in daily life or because of school work have been shown to be the most common triggers for headache in school-age youths.<sup>33,34</sup> One study of youths found that the levels of stress were significantly higher in a TMD group than in a control group. Higher levels of somatic symptoms were also found in the TMD group.<sup>35</sup>

In the present study, a subset of dental records of patients with TMD pain were retrieved to ascertain what treatment had been performed. In addition, the number of occlusal splints that had been made throughout the region was checked in a computerized record of treatment. This “double registration” of occlusal splint treatments showed that the subsample data were accurate, since both showed about 12% of adolescents were treated with occlusal splints. A previous investigation among dentists in 3 Swedish counties, of which 1 was Östergötland County, showed that the most common treatment for TMD was the provision of information to the patient about the condition, followed by occlusal splints.<sup>8</sup> In the present study the reverse was found; the occlusal splint was the most commonly documented intervention. However, it is the authors’ belief that the provision of information about TMD is underdocumented and that information about TMD is usually given to most patients diagnosed with the condition in the PDS clinics.

If those who were referred to the PDSS are included, 34% of those with TMD pain received some form of treatment by dentists. This is a somewhat lower value than the approximately 50% expected (ie, 50% had reported a subjective treatment need),<sup>4</sup> but this finding corresponds well with a previous systematic review of TMD treatment, which found that one fourth to one third of those reporting TMD pain also reported seeking treatment.<sup>5</sup> One factor of uncertainty is whether the individuals sought care of their own accord and received treatment elsewhere or previously had received some sort of treatment. There is no information on this in the dental records. One investigation in Linköping found that 41% of the youths in a TMD group had visited the school nurse and 31% had visited a physician because of TMD pain.<sup>35</sup>

All patients with caries received dental treatment, while only 34% of those with TMD pain were offered some form of treatment. The strong relationship between a dental pathology such as caries and subsequent treatment might reflect both tradition and knowledge, among other factors. Caries is a condition which dentists have been treating throughout the years. There is less uncertainty about the diagnosis, and the criteria for treatment are clear, as moderate and advanced carious lesions rarely regress.<sup>36</sup> In contrast, 1 study showed that in cases of TMD pain, clinicians felt uncertain about diagnostics, choice of therapy, and treatment.<sup>8</sup> This may explain some of the differences between treatment for these 2 conditions, although much more work needs to be done to understand these differences.

## Conclusions

The prevalence of TMD pain among adolescents in Östergötland County was found to be 4.2%. The prevalence of TMD pain was found to be significantly more common among girls (6.0%) than boys (2.7%). The prevalence of TMD pain significantly increased with age among both girls and boys, and the increase was about twice as great in girls as in boys. One third of the patients with TMD pain received treatment.

## Acknowledgments

This study was supported by the Public Dental Service of Östergötland County (Östergötland County Council).

## References

1. Marthaler TM, O'Mullane DM, Vrbic V. The prevalence of dental caries in Europe 1990–1995. ORCA Saturday afternoon symposium 1995. *Caries Res* 1996;30:237–255.
2. Jacobson S, Lennartsson B. Prevalence of malocclusion and awareness of dental appearance in young adults. *Swed Dent J* 1996;20:113–120.
3. Glendor U, Halling A, Andersson L, Eilert-Petersson E. Incidence of traumatic tooth injuries in children and adolescents in the county of Vastmanland, Sweden. *Swed Dent J* 1996;20:15–28.
4. List T, Wahlund K, Wenneberg B, Dworkin SF. TMD in children and adolescents: Prevalence of pain, gender differences, and perceived treatment need. *J Orofac Pain* 1999;13:9–20.
5. Drangsholt M, LeResche L. Temporomandibular disorder pain. In: *Epidemiology of Pain*. Crombie IK, Croft PR, Linton SJ, LeResche L, Von Korff M (eds). Seattle: IASP Press, 1999:203–233.
6. Nydell A, Helkimo M, Koch G. Craniomandibular disorders in children: A critical review of the literature. *Swed Dent J* 1994;18:191–205.
7. Magnusson T, Carlsson GE, Egermark-Eriksson I. An evaluation of the need and demand for treatment of craniomandibular disorders in a young Swedish population. *J Craniomandib Disord* 1991;5:57–63.
8. Tegelberg Å, List T, Wahlund K, Wenneberg B. Temporomandibular disorders in children and adolescents: A survey of dentists' attitudes, routine and experience. *Swed Dent J* 2001;25:119–127.
9. Skeppar J, Nilner M. Treatment of craniomandibular disorders in children and young adults. *J Orofac Pain* 1993;7:362–369.
10. Wahlund K, List T, Larsson B. Treatment of temporomandibular disorders among adolescents: A comparison between occlusal appliance, relaxation training, and brief information. *Acta Odontol Scand* 2003;61:203–211.
11. Tegelberg Å. Bettfysiologisk vård inom ett landstingsområde. Attityder och behov. *Tandläkartidningen* 1990; 82:1044–1052.
12. Tandhälsan hos barn och ungdomar 1985–2001. Socialstyrelsens meddelandeblad nr 8/2002.
13. Crombie IK. The potential of epidemiology. In: Crombie IK, Croft PR, Linton SJ, LeResche L, Von Korff M (eds). Seattle: IASP Press, 1999:1–5.
14. Wahlund K, List T, Dworkin SF. Temporomandibular disorders in children and adolescents: Reliability of a questionnaire, clinical examination, and diagnosis. *J Orofac Pain* 1998;12:42–51.
15. Nilner M. Prevalence of functional disturbances and diseases of the stomatognathic system in 15–18 year olds. *Swed Dent J* 1981;5:189–197.
16. Wänman A, Agerberg G. Two-year longitudinal study of symptoms of mandibular dysfunction in adolescents. *Acta Odontol Scand* 1986;44:47–54.
17. American Academy of Orofacial Pain. Okeson JP (ed). *Orofacial Pain. Guidelines for Assessment, Diagnosis, and Management*. Chicago: Quintessence, 1996:116.
18. Könönen M, Waltimo A, Nyström M. Does clicking in adolescent lead to painful temporomandibular joint locking? *Lancet* 1996;347:1080–1081.
19. Dworkin SF, Huggins KH, LeResche L, et al. Epidemiology of signs and symptoms in temporomandibular disorders. Clinical signs in cases and controls. *J Am Dent Assoc* 1990;120:273–281.
20. Nielsen L, Terp S. Screening for functional disorders of the masticatory system among teenagers. *Community Dent Oral Epidemiol* 1990;18:281–287.
21. Wänman A, Agerberg G. Recurrent headaches and craniomandibular disorders in adolescents: A longitudinal study. *J Craniomandib Disord* 1987;4:229–236.
22. Dworkin SF, LeResche L. Research Diagnostic Criteria for Temporomandibular Disorders: Review, criteria, examinations and specifications, critique. *J Craniomandib Disord* 1992;6:301–355.
23. Nilsson IM, List T, Drangsholt M. The reliability, specificity, and sensitivity of self-reported temporomandibular pain: Preliminary results. The Swedish National Convention 2003 [abstract]. *Swed Dent J* 2002;4:50.
24. Nilner M, Lassing SA. Prevalence of functional disturbances and diseases of the stomatognathic system in 7-14 year olds. *Swed Dent J* 1981;5:173–187.
25. Könönen M, Nyström M, Kleemola-Kujala E, et al. Signs and symptoms of craniomandibular disorders in a series of Finnish children. *Acta Odontol Scand* 1987;45:109–114.
26. Unruh AM. Gender variations in clinical experience. *Pain* 1996;65:123–167.
27. Von Korff M, Dworkin SF, LeResche L, Kruger A. An epidemiological comparison of pain complaints. *Pain* 1988;32:173–183.
28. Nikiforow R, Hokkanen E. An epidemiological study of headache in an urban and a rural population in northern Finland. *Headache* 1978;18:137–145.
29. LeResche L, Saunders K, Von Korff M, Barlow W, Dworkin SF. Use of exogenous hormones and risk of temporomandibular disorder pain. *Pain* 1997;69:153–160.
30. Kreipe RE, Kodjo CM. Adolescent Medicine. In: Behrman RE, Vaughan VC (eds). *Nelson Textbook of Pediatrics*, ed 16. Philadelphia: Saunders, 2000:251.
31. McNamara JA, Seligman DA, Okeson JP. The relationship of occlusal factors and orthodontic treatment to temporomandibular disorders. In: Sessle B, Bryant P, Dionne R (eds). *Temporomandibular Disorders and Related Pain Conditions. Progress in Pain Research and Management*. Seattle: IASP Press, 1995:211–226.
32. Brunelle JA, Bhat M, Lipton JA. Prevalence and distribution of selected occlusal characteristics in the US population, 1988–1991. *J Dent Res* 1996;75:706–713.
33. Passchier J, Orlebeke JF. Headaches and stress in schoolchildren: An epidemiological study. *Cephalalgia* 1985;5:167–176.
34. Larsson BS. The role of psychological, health behaviour and medical factors in adolescent headache. *Dev Med Child Neurol* 1988;30:616–625.
35. List T, Wahlund K, Larsson B. Psychosocial functioning in adolescents with temporomandibular disorders: A case-control study. *J Orofac Pain* 2001;15:218–227.
36. Swedish National Board of Welfare. Socialstyrelsens allmänna råd om diagnostik, registrering och behandling av karies. Stockholm, Sweden: SOSFS, 1988:30.