PREVALENCE OF SIGNS AND SYMPTOMS OF TEMPOROMANDIBULAR DISORDERS IN CHILDREN AND ADOLESCENTS WITH AND WITHOUT CROSSBITES

This study investigated the prevalence of signs and symptoms of temporomandibular disorders (TMD) in 1,134 orthodontically untreated children and adolescents (593 boys, 541 girls; age range 5 to 15 years) with and without crossbites. The sample with crossbites was further grouped according to the type (anterior, posterior, unilateral, or bilateral). The TMD symptoms bruxism (obvious active attrition/myalgia), joint sounds (clicking/crepitation), deviation during opening, reduced functional movements (maximum opening < 40 mm), and myopain (originating in the masticatory muscles/related to masticatory functions) were evaluated based on the standardized RDC/TMD protocol (Research Diagnostic Criteria for Temporomandibular Disorders) and compared among the various groups. Girls had a significantly higher prevalence of myopain than boys ($\chi^2 = 3.882$, $P < .05$). Furthermore, individuals with posterior unilateral crossbites showed a significantly higher prevalence of TMD symptoms ($\chi^2 = 33.877$, $P < .001$) and reduced functional movements ($\chi^2 = 10.800$, $P < .05$) than any other group. In conclusion, sex and type of crossbite play a role in the prevalence of TMD signs and symptoms. World J Orthod 2010;11:37–42.

Key words: temporomandibular disorders, crossbites, RDC/TMD protocol

The prevalence of temporomandibular joint disorders (TMD) in children and adolescents has been frequently investigated. Most studies report a great variation of TMD signs and symptoms. This could be partially attributed to some inter- and intraexaminer variation, as well as the diagnostic methods that were applied without considering the age or cognitive development of children. Most studies on TMD in young individuals were cross-sectional and the risk factors for TMD were determined by logistic regression analysis. It became obvious that sex (girl odds ratio [OR] = 1.7) and unilateral chewing (OR = 1.5) were the most significant risk factors.

Prospective studies also revealed interesting findings. Könönen and Nyström investigated TMD signs and symptoms in 131 Finnish adolescents aged 14, 15, and 18 years. They observed that clicking was the most frequent sign, which increased with age, although there was considerable intraindividual fluctuation over time with no predictable pattern. Later, Suvinen et al followed a sample of 128 Finnish males and females (15, 18, and 23 years old) for 8 years, recording their TMD and psychosomatic symptoms. They found that females were affected approximately twice as often as males.

Even more recently, Magnusson et al found that unilateral crossbite is associated, although weakly, with the presence of TMD signs and symptoms.

Although sex and crossbite can seriously be considered risk factors for TMD,
many studies did not take them into account. Thus, the aim of this investigation was to assess the TMD signs and symptoms in a sample of Caucasian children and adolescents who were divided into groups on the basis of sex and presence and the type of crossbites.

PATIENTS AND METHODS

One thousand one hundred thirty-four subjects (593 boys, 541 girls; age range 5 to 15 years) with TMD were selected for this study. All individuals with muscle affections clearly not associated with TMD, such as polyarthritis, acute injuries, metabolic diseases, neurologic disorders, vascular diseases, neoplasia, psychiatric disorders, or drug abuse were excluded. Other exclusion criteria were medical-dental emergencies, as well as visual, auditory, and motor impairments. Finally, all patients who received medication, particularly that affecting the central nervous system, were excluded. The study was approved by the Institutional Review Board.

Two dentists (S.T. and F.F.) examined all patients clinically, registered any sign or symptom of TMD, and collected respective social and demographic information. All subjects were divided into groups according to sex and the presence and type of crossbites: no crossbite (645 patients), anterior crossbite (193 patients), posterior bilateral crossbite (251 patients), and posterior unilateral crossbite (45 patients). The examination for TMD was based on the standardized RDC/TMD protocol (Research Diagnostic Criteria for Temporomandibular Disorders).

Signs were diagnosed if patients suffered from bruxism, which was obvious by myalgia associated with parafunctions and shiny, flat tooth surfaces (attritions).

Both clicking and crepitation were classified as joint sounds, even though they are very different in nature.

In a healthy masticatory system, the mandible will move straight up and down during opening and closing, so any altered movement was recorded as a deviation.

The normal range of mandibular opening is between 53 and 58 mm in adults. However, 5- to 6-year-old children can normally open their mouth a maximum of only 40 mm. Hence, a restricted mandibular opening was considered if the distance between the incisal edges was less than 40 to 50 mm, considering both the overbite and the age of the patient. Individuals between 6 and 11 years of age were categorized as children in whom the standard opening distance was fixed at 40 mm; those who were 12 to 15 years old were regarded as adolescents with a standard opening distance of 45 mm. In individuals 5 to 6 years of age, the normal opening limit was set at 38 mm. Lateral and protrusive movements were noted as limited if they were less than 8 mm.

Muscle tenderness or pain was evaluated by manual palpation. Myopain was diagnosed when it originated in the masticatory muscles and was related to masticatory function. Palpation was performed with mainly the palmar surface of the middle finger, while the index and forefinger tested the adjacent area. Soft but constant pressure was applied in a small circular motion to the respective muscle. The muscles and tendons palpated were the superficial masseter, anterior temporalis, middle temporalis, posterior temporalis, posterior cervicalis, sternocleidomastoideus, anterior and posterior digastric, medial pterygoid, lateral pterygoid, temporalis tendon, deep masseter, and upper trapezius. The affected patients defined their degree of pain (from none [0] to extreme [100]).

Symptoms were diagnosed when the patients described or complained about acute muscle discomfort or pain (ranging from slight tenderness to extreme pain or stiffness) in the joint area (arthralgia), the neck and the shoulders, and during function; difficulties in mouth opening; or a sensation of a stuck or locked TMJ.

Method error

To assess the inter- and intraobserver method error, 10 patients were evaluated separately a second time by two investigators (F.F. and S.T.). The two evaluations
by the two investigators were compared with respect to each variable. The error variance was calculated using Dahlberg's formula:

$$\delta = \sqrt{\frac{\sum d^2}{2N}}$$

where \(d\) is the difference between the first and the second measurement and \(N\) the number of double registrations.

Statistical analysis

Standard statistical analysis was carried out using SPSS 11.5 for Windows (SPSS). The incidence of signs and symptoms of TMD were compared among the various groups using \(\chi^2\) analysis. The level of significance was set at \(P < .05\).

RESULTS

For each variable, the intra- and the inter-observer method error was found to be less than 5.0% of the biologic variance.

The prevalence of signs and symptoms of TMD according to age and sex is displayed in Table 1. The \(\chi^2\) test revealed a significantly higher prevalence of myopain among females (10.4%) than males (6.4%) (\(\chi^2 = 3.882, P < .05\)).

The prevalence of signs and symptoms of TMD in subjects with and without crossbites is presented in Table 2. In this study, the prevalence of TMD symptoms was similar in patients with and without crossbites (20.2% to 22.8%). Only patients with posterior unilateral crossbites showed significantly more TMD symptoms (60.0%, \(\chi^2=33.877, P < .01\)) and restricted functional movements (6.7%, \(\chi^2 = 10.800, P < .05\)) than any of the other groups.

DISCUSSION

The stratification of patients was based on Magnusson et al., whose 20-year follow-up study identified unilateral crossbite as a risk factor for the development of TMD. However, in contrast to that study, this one
was cross-sectional because the latency period of the disease is long.\textsuperscript{31,32}

The average percentage (25.0\%) of TMD symptoms obtained in this study is similar to that found by other researchers in cross-sectional investigations.\textsuperscript{3,4,5,11} It was somewhat higher in the evaluation of 385 schoolchildren (230 females, 155 males; 12 to 16 years) by Feteih\textsuperscript{16} in which it amounted to 33.0\%.

The findings are similar if the study design is longitudinal. Suvinen et al\textsuperscript{6} evaluated TMD and psychosomatic symptoms in 128 Finnish young adults over an 8-year period (at 15, 18, and 23 years). About 6.0\% to 12.0\% of the subjects reported pain, 12.0\% to 28.0\% demonstrated dysfunction, and 4.0\% to 7.0\% had a combination.

In the majority of studies, females show a higher percentage of TMJ symptoms in general, with myopain being the most prevalent.\textsuperscript{14,15,17,33–37} For instance, Widmalm et al\textsuperscript{4} noticed in 153 Caucasians and 50 African-American children (4 to 6 years of age) that the girls had a significantly higher prevalence of “pain or tiredness during chewing” (a type of pain that can be referred to as myopain) than the boys. Wahlund\textsuperscript{36} investigated 864 adolescents from a public dental service clinic and also found a higher prevalence of TMD pain in girls. According to Suvinen et al,\textsuperscript{6} the ratio of females to males with symptoms is approximately 2 to 1. Nilsson et al\textsuperscript{19} studied adolescents at age 12 to 15 years and 16 to 19 years. Again, in the entire sample, there was a significantly higher incidence of TMD pain among females (4.5\%) than males (1.3\%). In addition, TMD pain increased with age among girls significantly (P < .05) more (3.0\% to 6.9\%) than in boys (1.7\% to 2.6\%). Finally, Huddleston Slater et al\textsuperscript{18} evaluated the prevalence and risk factors for anterior disc displacement with reduction and TMJ hypermobility in children (4 to 18 years), adolescents (19 to 30 years), and adults (older than 30 years). A higher prevalence of TMJ hypermobility was observed among girls (13.8\%) than boys (8.2\%) with sex (OR = 2.07) and muscle pain (OR = 1.95) as the main risk factors.

Only the studies by Otuyemi et al\textsuperscript{5} and Bonjardim et al\textsuperscript{11} failed to report a general difference between the sexes. However, Otuyemi et al investigated subjects aged 17 to 32 years. Also, their index was based on the intensity of signs and symptoms (not significant, mild, and severe); in the present study, the sign myopain was considered independently from the symptom pain. This remark underscores the difficulty in comparing the data of studies and emphasizes the advantage of monitoring signs and symptoms (for example myopain/pain) independently. Similarly, Bonjardim et al\textsuperscript{11} classified signs and symptoms of TMD as a single category. Though there was no general difference between the sexes, they reported a significantly higher prevalence of “tenderness of the lateral pterygoid muscles” in girls.

The findings of the present study regarding bruxism are partly in agreement with the current literature. The study by Magnusson et al\textsuperscript{12} and Casanova-Rosado et al\textsuperscript{15} reported an association between bruxism and TMD symptoms. This could not be confirmed by this study because it lacks follow-up and a logistic regression analysis. Magnusson et al\textsuperscript{12} further concluded that grinding is a predictor of TMD treatment during the 20-year follow-up.

As far as crossbite is concerned, Magnusson et al\textsuperscript{12} observed only a weak association between TMD signs and symptoms and occlusion, although they defined unilateral crossbite as a risk factor. Similarly, the logistic regression analysis of Casanova-Rosado et al\textsuperscript{15} with TMD as the dependent variable identified unilateral chewing (OR = 1.5) as the variable most often associated with TMD.

With regard to restricted functional movements, the results of this study are comparable to those of Otuyemi et al\textsuperscript{5} but in contrast to that of Hirsch et al,\textsuperscript{14} who reported that the values for mandibular movements were influenced by only age and sex.

Although the majority of the present findings corresponds with those observed in other studies, this one has several limitations. One is that crossbites of just one pair of antagonistic teeth were included and
that it was not checked if a crossbite was forced or unforced (ie, a RCP-ICP difference existed).

Finally, it was not taken into account that a subject could have had one or more signs and symptoms of TMD.

CONCLUSIONS

TMD signs and symptoms were recorded in 1,134 subjects with and without crossbites. The sample was divided into groups on the basis of sex, presence or absence of crossbites, and type of crossbite (anterior, posterior, unilateral, or bilateral). The prevalence of signs and symptoms of TMD was compared among the groups. Although there were some limitations in the study design, females showed a significantly higher prevalence of myopain than males ($\chi^2 = 3.882, P < .05$). Furthermore, individuals with posterior unilateral crossbite had a significantly higher prevalence of TMD symptoms ($\chi^2 = 33.877, P < .01$) and reduced functional movements ($\chi^2 = 10.800, P < .05$). On the basis of these findings, sex and type of crossbite seem to play a role in the prevalence of TMD signs and symptoms in children and young adolescents.

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