Gender Difference in Symptoms Related to Temporomandibular Disorders in a Population of 50-Year-Old Subjects

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Aims: *To investigate, by means of a mail questionnaire, the prevalence of symptoms related to temporomandibular disorders (TMD) in 50-year-old subjects living in the counties of Örebro and Östergötland, Sweden.* ***Methods:*** *The total population comprised 8,888 individuals, and the overall response rate was 71%. A clinical evaluation of the masticatory system was performed in subgroups to validate the responses to the questionnaire. There was satisfactory correspondence between self-reports and well-defined clinical conditions.* ***Results:*** *Women reported, more often than men, pain from the temporomandibular joints (TMJs), TMJ sounds, bruxism, sensitive teeth, and burning mouth symptoms. The prevalences of difficulties in jaw opening, loss of anterior teeth due to trauma, and masticatory problems were greater in men than in women. No gender difference was found in the number of remaining teeth. Logistic regression analysis with pain from the TMJ as the dependent variable identified bruxism, impaired chewing efficiency, and gender (women) as the most significant risk factors. With reduced chewing ability as the dependent variable, several missing teeth constituted the highest risk, followed by pain from the TMJ, bruxism, gender (men), and loss of anterior teeth due to trauma.* ***Conclusion:*** *There were significant gender differences in reported TMD-related symptoms in 50-year-old Swedes. Bruxism was a significant risk factor for pain from the TMJ. Reduced number of teeth and pain from the TMJ were significant risk factors for impaired chewing ability.*
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Key words: bruxism, chewing ability, epidemiology, orofacial pain, temporomandibular joint

Temporomandibular disorders (TMD) represent a major cause of nondental pain in the orofacial region and are considered to be a subclass of musculoskeletal disorders.[1–3], Epidemiologic research has demonstrated a high prevalence of signs and symptoms of TMD in virtually all examined populations and age groups.[4,5] There is a strong female predominance among patients in TMD clinics. This has not been entirely clarified by epidemiologic studies, and psychosocial factors have frequently been suggested as an explanation for the skewed gender distribution. More recent investigations have often found higher prevalences of most TMD signs and symptoms in women than in men.[6–9] However, these differences have not been large enough to explain why so many more women than men seek care for TMD, and it has been suggested that physiologic and hormonal factors should also be considered.[10]

The etiology of TMD has long been a very controversial issue, and it has been maintained that, at the beginning of the new millennium, the knowledge of what causes TMD is limited.[11,12] The unresolved problems in the TMD field indicate that more research is needed.

In 1992, an evaluation of oral health attitudes towards and experience of dental care among all the 50-year-old subjects in the Swedish counties of Örebro and Östergötland was performed. It aimed at serving as a basis for planning of the Public Dental Health resources.[13] A part of the investigation focused on signs and symptoms related to TMD, which forms the basis for this paper.

The aims of this paper were to report on the prevalence of TMD-related symptoms, with the focus on possible gender differences, and to make a risk assessment for the occurrence of such symptoms in 50-year-old Swedes. It was hypothesized that women had higher prevalence of these symptoms, and that no specific risk factor should be found.

Materials and Methods

Population and Response Rate

In 1992, a cross-sectional mail questionnaire was sent to all 50-year-old persons in 2 counties in Sweden, Örebro and Östergötland, altogether 8,888 persons (3,633 in Örebro and 5,255 in Östergötland). The final response rate was 71.3% (6,343 persons); the same rate in both counties. Details of procedures are reported elsewhere.[14] In this study, only data from those who answered the questions about pain from the TMJ were analyzed. Due to some internal non-response, the number of these persons was 6,043 (68.0% of the population). Gender was the only variable that allowed the representativity of the respondents to be controlled. There was no significant difference (χ^2 = 0.58, 1 df; $P > .05$) in gender composition of the respondents compared to the non-respondents.

Questionnaire

The questionnaire comprised 53 questions, with altogether 123 items. It was designed with 6 different sections: *(1)* general socioeconomic conditions (eg, age, gender, occupation); *(2)* general health (eg, physician visits, tobacco habits, drug consumption); *(3)* oral conditions (eg, satisfaction with teeth, oral problems, oral hygiene habits, number of teeth); *(4)* a series of attitude questions concerning function and appearance of teeth; *(5)* experience and use of dental care; and *(6)* most recent visit to a dentist.

Data Registration

Data were recorded by dental personnel. Clinical examination was performed in a randomly selected subgroup of the total sample (457 men and 484 women) to validate and quantify the responses regarding reported number of remaining teeth and jaw-opening capacity. There was good congruence between self-reports and clinical registrations, and the level of congruence did not differ significantly between men and women.[15] The variables in the questionnaire and their dichotomizations forming the basis for the distributional analysis are shown in Table 1. The complete questionnaire design has previously been described.[13]

Statistical Methods

All statistical analyses were performed with the Statistical Package for Social Sciences (SPSS, Release 11.0) on an IBM personal computer. Chi-square test and odds ratios (OR) were used to analyze differences between men and women. Further, the data were analyzed in contingency tables and by regression analysis. As all the variables were binary, logistic regression models were used. Model fit was assessed by model chi-square test. $P < .05$ was considered to indicate statistical significance.

Results

Women reported a higher prevalence of pain and sounds from the TMJ, bruxism, and sensitive teeth in comparison with men, who more often had difficulties in jaw opening and chewing problems (Table 2). Women also had a somewhat higher prevalence of burning mouth symptoms than men, although a 95% confidence interval (CI) for OR included 1.0. More women than men had had orthodontic treatment, whereas men reported loss of anterior teeth due to trauma more frequently than women (Table 3). Women visited dentists more frequently than men: 28% of the women reported dental visits ≥ 2 times per year compared to 24% of the men ($P < .001$, OR 1.25, 95% CI 1.11–1.40) (Tables 4a and 4b). There was no significant gender difference in the number of remaining teeth, and 79% of both men and women had all or almost all teeth remaining.

Table 1 Questionnaire: Questions and Response Alternatives and Their Dichotomizations

Question regarding	Response alternatives	Dichotomized
Pain in the TMJ region TMJ sounds (clicking/crepitation) Wide jaw opening Grinding or clenching of the teeth* Burning mouth Sensitive teeth	No problems	Category 1
	Some problems Rather great problems Great problems	Category 2
Remaining teeth	All teeth remaining Missing 1 or a few single teeth	Category 1
	Missing many teeth Almost no teeth left Edentulous	Category 2
Chewing efficiency	Very good	Category 1
	Rather good Not so good Bad	Category 2
Orthodontic treatment Dental trauma	Yes	Category 1
	No Can't remember No answer	Category 2
Frequency of dental visits	≥ 2 times per year	Category 1
	Once a year Every second year More seldom	Category 2

*ie, bruxism.

Table 2 Prevalence of TMD-Related Symptoms in Men and Women (%)

	n	Symptoms (%)	OR	*P*	95% CI
Pain from TMJ					
Men	3010	6.7	0.51	< .001	0.43–0.61
Women	3033	12.4			
Joint sounds					
Men	2986	12.0	0.69	< .001	0.60–0.80
Women	3009	16.5			
Difficulty in jaw opening					
Men	2995	8.2	0.71	< .001	0.60–0.85
Women	3012	11.2			
Bruxism					
Men	2985	15.5	0.73	< .001	0.64–0.83
Women	2999	20.2			
Sensitive teeth					
Men	2976	30.0	0.68	< .001	0.61–0.75
Women	2994	38.9			
Burning mouth					
Men	2982	4.1	0.77	< .05	0.60–1.00
Women	3003	5.3			
Chewing					
Men	3005	27.2	1.13	< .05	1.01–1.27
Women	3025	24.8			

Odds ratios (OR) and confidence intervals (CI) refer to women as reference category. The *P* value denotes the significance level of OR (chi-square test).

Table 3 Prevalence of Reported Known Previous Orthodontic Treatment and Loss of Anterior Teeth Due to Trauma in Men and Women (%)

	n	Symptoms (%)	OR	*P*	95% CI
Orthodontic treatment					
Men	3010	9.4	1.32	< .01	1.12–1.55
Women	3033	12.0			
Dental trauma					
Men	3010	16.2	0.39	< .001	0.33–0.46
Women	3033	7.0			

Odds ratio (OR) and confidence interval (CI) refer to women as reference category. The *P* value denotes the significance level of OR (chi-square test).

Table 4 Logistic Regression Model for Pain from TMJ as a Dependent Variable

	β	OR	*P*	95% CI
Female gender	0.686	2.00	< .001	1.64–2.44
Loss of anterior teeth due to trauma	0.275	1.32	.056	1.00–1.75
Lower number of remaining teeth	0.150	1.16	.192	0.93–1.46
Orthodontic treatment	0.297	1.35	.030	1.03–1.75
High frequency of dental visits	–0.004	1.00	.966	0.81–1.23
Reported bruxism	1.701	5.48	< .001	4.53–6.62
Impaired chewing efficiency	0.874	2.40	< .001	1.95–2.95

β = regression coefficient; OR = odds ratio; *P* = significance level; CI = confidence interval. –2LL = 3,120, df = 7, correctly classified cases = 91%.

Table 5 Logistic Regression Model for Chewing Efficiency as a Dependent Variable

	β	OR	*P*	95% CI
Male gender	0.245	1.28	< .001	1.12–1.46
Loss of anterior teeth due to trauma	0.217	1.23	.028	1.02–1.52
Lower number of remaining teeth	1.921	6.83	< .001	5.93–7.86
Orthodontic treatment	0.097	1.10	.353	0.90–1.35
High frequency of dental visits	–0.032	0.97	.665	0.84–1.12
Reported bruxism	0.264	1.30	.002	1.10–1.54
Pain from TMJ	0.868	2.38	< .001	1.93–2.94

β = regression coefficient; OR = odds ratio; *P* = significance level; CI = confidence interval. –2LL = 5,738, df = 7, correctly classified cases = 78%.

Logistic regression analysis, with "pain from TMJ" as the dependent variable, identified bruxism as the most significant risk factor, followed by impaired chewing ability, female gender, and previous orthodontic treatment (Table 4). With "chewing ability" as the dependent variable, several missing teeth constituted the highest risk for impaired chewing ability, followed by pain from the TMJ, bruxism, male gender, and loss of anterior teeth due to trauma (Table 5).

Discussion

In this study, the higher prevalence of several TMD-related symptoms in women deviates somewhat from the early epidemiologic investigations[16] but is in accordance with results from more recent research (for reviews see Carlsson 1999, LeResche 1997).[4,17] It also confirmed the first part of our hypothesis: Pain from the TMJ (the wording in the Swedish question was "pain around the jaw-joint") was almost twice as prevalent in women (12.7%) than in men (6.7%). These figures correspond well with mean data on pain in the temporomandibular region (11.3% in women, 6.5% in men) calculated from 6 population-based studies from 5 countries presented in a recent review.[5] In the same article, rates of pain in the TMJ were lower (6.9% and 4.9% for women and 3.5% and 2.5% for men) in the 2 studies that had specified the location of pain more than most of the other

studies that had not specified pain locations. Pain from the TMJ or the TM region, which has been the most common wording of the questions, probably includes muscle pain. It is difficult for patients to differentiate between joint and muscle pain and it is also not always easy at a clinical examination either. However, pain in the TMJ region is certainly a symptom related to TMD, and it is evidently more common in women than in men.

Other pain-related symptoms, such as sensitive teeth and burning mouth, were also more frequent in women. Several but not all studies have demonstrated higher prevalence of burning mouth pain in women than in men, but the total rates have varied much because of different definitions and sample compositions (1% to 15%). The difference here was, however, barely significant. Age and being female seem to increase the risk of acquiring burning mouth pain.[5,7,18] It is also of interest to mention that burning mouth pain has been one of the most frequent symptoms in patients with presumed "oral galvanism."[19,20] Possible mechanisms underlying gender differences in pain have recently been discussed in an extensive review.[10] The question is very complex and as yet no certain answer can be given: "While evidence for sex differences in pain has not been established beyond doubt, distinct anatomic and hormonal features in women and men provide compelling clues that their pain might be modulated in a differential manner by a number of biologic factors."[10] One might add that there also may be social and cultural factors at play. A recent epidemiologic study of TMD symptoms in Hong Kong Chinese found no gender-related differences (and lower prevalences than in many European studies).[21] It was concluded that cultural differences in the perception and reporting of symptoms may explain, at least in part, these divergent findings.

Men reported functional problems, such as difficulty in jaw opening and chewing problems, more often than women. In addition, men had had more trauma to the orofacial region, in this case resulting in more loss of anterior teeth than in women. In this regard, a positive relationship between trauma and TMD has been shown in several studies.[22–24]

The present analysis of possible risk factors for occurrence of pain from the TMJ revealed bruxism as the most significant factor. The relationship between bruxism and TMD signs and symptoms is not well known, although many clinicians have considered that bruxism is closely associated with the development of TMD. However, a scrutiny of the scientific literature has indicated that the evidence for such a relationship is weak.[25–27] The present results should strengthen the opinion that bruxism is related to TMD, which has been supported by some recent studies.[8,22]

One problem in studying bruxism is that it is based on self-report of a phenomenon that people are to a great extent unaware. It has been suggested that the use of self-report of tooth grinding is methodologically inadequate for addressing the relationship between tooth grinding and TMD.[28] Another problem is that nocturnal and diurnal bruxism may be different disorders. In this study, as in most investigations, the 2 types of bruxism have been taken together. The occurrence and extent of bruxism are difficult to establish in a clinical setting with any known methods. The diagnosis of bruxism may require sleep laboratory studies with polysomnographic recordings, which are practically impossible to use in large epidemiologic investigations. It is obvious that the self-report used in this study must be interpreted with caution. The significant association does not prove a cause-effect relationship between bruxism and TMD symptoms. Another interpretation suggested in a recent review is that bruxism and TMD symptoms may be coexisting entities in a considerable number of subjects.[27]

The risk for TMJ pain was significantly increased in individuals who had had earlier orthodontic treatment. As with bruxism, the association does not prove a cause-effect relationship, and as yet unknown cross-correlational factors could be responsible for the association between TMJ pain and orthodontic treatment. The general consensus today is that orthodontic treatment does not induce, cure, or reduce the risk for future development of TMD.[29–33] While the minor role played by the occlusion as an etiologic factor in the development of TMD is well established, identification of a specific occlusal relationship with TMD remains as elusive as ever.[11]

The present study constitutes one of the largest samples examined for TMD symptoms, and therefore the findings should be of interest. A problem with epidemiologic studies is the participation rate and representativity of the sample. In the original sample, 71% of the total population participated.[13] Because of non-response to some questions included in this study, the material for the present analyses comprised 68% of the population. It is difficult today to get a higher participation rate in this type of investigation in Scandinavia and probably anywhere.[34] The only factor that could be controlled for analysis of the possible effect of loss of participants was the gender distribution, which was very similar among responders and non-responders. An optimistic interpretation might be

that the loss of responders did not impair the study results to any greater extent.

The most important variables for the subjective assessment of chewing ability were the number of remaining teeth and pain from the TMJ. It is well established that a reduction of the number of teeth, or rather occlusal units, leads to a decrease of the masticatory performance, ie, the capacity to comminute test food in laboratory tests. On the other hand, there is only a weak correlation between subjective assessment of chewing ability and laboratory measurement of masticatory performance.[35] People seldom complain of impaired chewing ability if they have at least 20 remaining teeth, but the chewing problems increase with decreasing number of teeth.[36,37] Therefore, the results found are logical, since the analyzed sample had a variation of dental state from a full complement of natural teeth to edentulism. The finding that pain from the TMJ was also a strong risk for impaired chewing ability emphasizes that TMD problems have functional consequences for the masticatory system.

The complexity in the development of TMD is great, however, and in addition to the factors discussed in this paper, socioeconomic aspects and changes over time due to altered living circumstances are probably other contributory factors. These background conditions and their interrelationships with TMD will be addressed in subsequent papers.

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