Longitudinal course of symptoms of craniomandibular disorders in men and women

A 10-year follow-up study of an epidemiologic sample

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An epidemiologic sample (n = 285) drawn from the population of Skellefteå, Sweden, was examined to evaluate the prevalence of signs and symptoms of craniomandibular disorders (CMD) at the age of 17 years. The sample was then followed up prospectively at the ages of 18 and 19 years. The year they reached 28 years of age a questionnaire concerning prevalence, incidence, frequency, duration, location, and intensity of symptoms of CMD was sent to the same subjects. Two hundred and thirty-four subjects responded (82%). The number of subjects who participated in all examinations (at the ages of 17, 18, 19, and 28 years) was 215 (107 women and 108 men). During the 10-year period from the late teens onwards, a significant increase in reported symptoms of CMD occurred in both men and women. For the whole sample the prevalence increased from approximately 20% to 37%. The incidence of CMD symptoms at the age of 28 years was 6% in both sexes. Although fluctuations of symptoms during the period from the age of 17 to 28 occurred in both sexes, the course of CMD in men and women differed significantly. All women who consistently reported symptoms at the age of 17–19 years also reported symptoms at the age of 28 years; the corresponding figure for men was 60%. At the age of 17 years 25 women reported CMD; 23 of these reported CMD at the age of 28 years (92%). At the age of 17 years 17 men reported CMD; 5 of these reported CMD at the age of 28 (29%). The result indicates different courses for CMD in men and women. ☐ *Bruxism; epidemiology; temporomandibular disorders*

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From the beginning of the 1970s a large number of studies, basing their methods on epidemiology, has been published on the subject of temporomandibular dysfunction (TMD)/craniomandibular disorders (CMD). The pioneer work in this field was done in Scandinavia (1–3), where a high prevalence of signs and symptoms of mandibular dysfunction in the population was reported. The large number of publications from all over the world during the 1980s and 1990s indicates an increasing interest in the subject (4–31). The great majority of studies have used a cross-sectional design, but despite the great number of studies no consensus about the real prevalence has been established due to the great variations in the results (32). One explanation frequently offered is variation in the methods, criteria, and composition of the materials used. Even though controversies do exist, the results indicate that signs and symptoms of TMD/CMD are of low prevalence in preschool children (9, 17) and increase with age up to retirement (13, 25, 30). These results could indicate that TMD/CMD is progressive, which has also been proposed on the basis of clinical experience—for example, TMJ clicking progressing into locking and pain. The first longitudinal studies were published during the 1980s. These were mainly conducted on youths and documented a highly fluctuating course for both signs and symptoms of CMD (33–41) and headaches (38, 42) during adolescence. Recently, a study on elderly subjects has shown a similar pattern, indicating that the finding in children and adolescents may also be true for the elderly (43).

One unanswered question in the field of TMD/CMD is the discrepancy found between the gender relation in clinical materials (44) and in epidemiologic samples (45). While women by far exceed men as patients, this huge difference cannot be verified in the general population (46), even though recent studies have reported some differences for TMJ sounds and palpation tenderness (47, 48). Two previous longitudinal studies (34, 41) found that during adolescence approximately 10% of the population reported symptoms of CMD consistently and on that basis hypothesized that these might run a higher risk of developing more severe signs and symptoms of CMD with increasing age.

The aim of this study was to evaluate the longitudinal course of symptoms of CMD in men and women during a 10-year period in a sample previously studied for a 2-year period during late adolescence. The study also aimed to evaluate the risk of developing CMD in various cohorts.

Materials and methods

An epidemiologic sample (n = 285) drawn from the

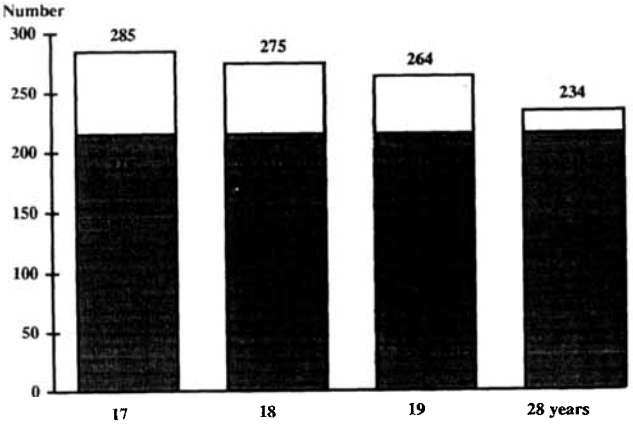

Fig. 1. Number of subjects examined at the ages of 17, 18, 19, and 28 years. Basic sample, $n = 285$. Shaded areas of the bars indicate those who were examined on all four occasions.

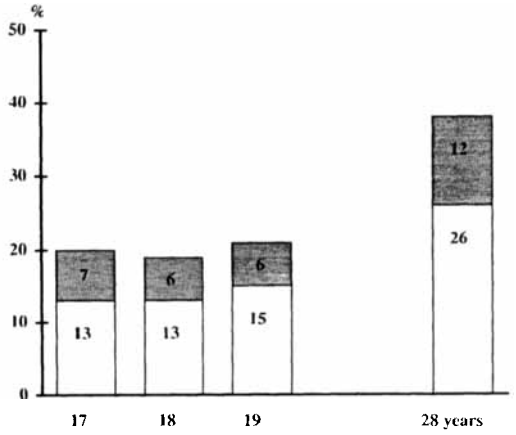

Fig. 2. Percentage distribution of the anamnestic dysfunction index (AiI = open bars; AiII = shaded bars) in a sample followed up longitudinally at the ages of 17, 18, 19, and 28 years.

population of Skellefteå, Sweden, was examined to evaluate the prevalence of signs and symptoms of CMD at the age of 17 years (15). The participation rate was 100%. The sample was then followed up prospectively at the ages of 18 and 19 years. At the age of 18 years 10 subjects dropped out, and at the age of 19 years 21 of the original sample dropped out. During the 2-year period from 17–19 years a total of 258 subjects participated in all 3 examinations, which were made during the month of their birthday (48). The year the subjects were 28 years old a questionnaire concerning the prevalence, incidence, frequency, duration, location, and intensity of symptoms of CMD was sent to the subjects. Two hundred and thirty-four subjects responded (82%). The number of subjects who participated in all examinations (at the ages of 17, 18, 19, and 28 years) was 215 (107 women and 108 men) (Fig. 1). Thus, in the longitudinal analysis 75% of the original sample was available for analysis. To evaluate whether the dropout was related to any systematic factor related to the presence or absence of CMD, the prevalence of the included variables was calculated for the 215 subjects at the ages of 17–19 years and then compared with the prevalence of the total sample at the same ages. No significant differences were found.

The term prevalence has been used to describe the number of subjects in the sample with a disorder in relation to the total number of subjects in the sample; in this study all subjects who reported one or more symptoms of mandibular dysfunction were divided by all subjects in the sample. The term incidence has been used to describe the number of subjects who had developed a disorder within the past year in relation to the number of subjects without that disorder at start. In this study those who reported symptoms of CMD at the age of 28 years with a duration of less than 1 year and with no previous symptoms of CMD were divided by all who did not report CMD at the age of 28 years, with the incidence cases added in.

Statistical methods

The chi-square test or Fisher's exact test (two-sided) was used in the analyses. Calculation of the relative risk (RR) has been measured by the prevalence odds ratio, being the probability of being a case divided by the probability of not being a case, in accordance with the formula $RR = P2(1 - P1)/P1(1 - P2)$, where P1 is the prevalence of a symptom in one population and P2 is the prevalence of the same symptom in another population. A 5% level of significance was used.

Results

During the 10-year period from the late teenage years the prevalence of symptoms of CMD increased from approximately 20% at the ages of 17 to 19 years to 37% at the age of 28 years (Fig. 2). The prevalence of both mild (AiI) and severe (AiII) symptoms doubled during the period. A similar increase of reported awareness of bruxism (clenching and grinding) also occurred in the sample (Fig. 3) during the 10-year period. The incidence of symptoms of CMD at the age of 28 years was 6%.

Although fluctuations of symptoms during the period from the age of 17 to 28 years occurred in both men and women (Fig. 4), the course of CMD symptoms in men and women differed significantly. At the age of 17 years 25 women reported CMD, 23 of whom reported CMD at the age of 28 years (92%) (Table 1). At the age of 17 years 17 men reported CMD, 5 of whom reported CMD at the age of 28 (29%) (Table 1). The relative risk that the cohort of symptomatic (AiI, AiII) 17-year-old

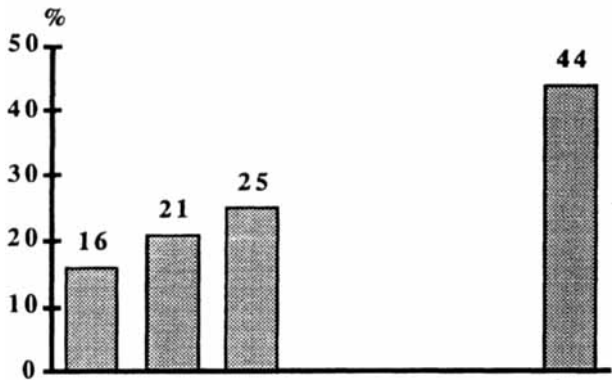

Fig. 3. Percentage distribution of awareness of bruxism (grinding and/or clenching) in a sample followed up longitudinally at the ages of 17, 18, 19, and 28 years.

Table 1. Number (*n*), percentage distribution, and relative risk (*RR*) for reported symptoms of mandibular dysfunction (Ai) at the age of 28 years among cohorts. One cohort consists of those subjects who did not report any symptom of mandibular dysfunction at age of 17 years; the second consists of those who reported mild symptoms (AiI), and the third of those who reported severe symptoms (AiII) at the age of 17 years

	n	Ai 28 years	(%)	*RR*	*P*
Ai 17 years, women					
No symptoms (Ai0)	83	29	(35)		
Mild symptoms (AiI)	17	15	(88)	2.5	
Severe symptoms (AiII)	8	8	(100)	2.8	<0.001
Ai 17 years, men					
No symptoms (Ai0)	90	24	(27)		
Mild symptoms (AiI)	12	3	(25)	0.9	
Severe symptoms (AiII)	5	2	(40)	1.5	NS

girls would have symptoms at the age of 28 years, in comparison with the cohort of girls with no CMD symptoms at the age of 17 years, was 2.5–2.8. All females who consistently reported symptoms at the ages of 17–19 years also reported symptoms at the age of 28 years; the corresponding figure for men was 60% (Table 2). The relative risk that the cohort consisting of women who consistently reported symptoms during late teenage years, would report symptoms at the age of 28 years was 4.2, in comparison with the cohort of women who did not report symptoms during the late teenage period.

A similar pattern was found for the consistency of reporting TMJ sounds and fatigue in the jaws among women, as all these subjects reported symptoms at the age of 28 years (Tables 3 and 4). One-third of those women who occasionally reported TMJ sounds and half of the men who occasionally or consistently reported TMJ sounds during the late teenage period did not report any symptom of CMD at the age of 28 years.

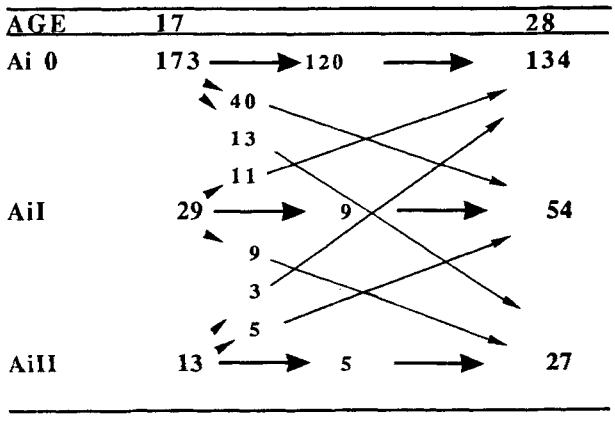

Fig. 4. Distribution of the longitudinal pattern of changes in subjects on the basis of the anamnestic index (Ai) from the age of 17 to 28 years ($n = 215$).

Regardless of whether the cohort was based on the severity of symptoms at the age of 17 years or on the consistency of reported symptoms during the late teenage period within each group, approximately half of those women who reported symptoms at the age of 28 years had mild, and approximately half had severe symptoms. Among the male cohort thus constituted, most (approximately three-quarter) of those who reported symptoms at the age of 28 years had mild symptoms.

The ratio between men and women for the prevalence of symptoms of CMD/TMD was 1:1.5 at the age of 17 years, 1:1.8 at the age of 28, 1:3.2 during the late teenage period (consistent symptoms), and 1:5.3 both during the late teenage period and at the age of 28 years.

Discussion

In prospective studies some dropout of participants will always occur, which may affect the results of the study. In this longitudinal study the dropout rate at the age of 28 years was not related to the presence or absence, severity, or consistency of CMD at the beginning of the study, nor was it related to gender, making it reasonable to assume that the results were representative of the whole sample.

An increase in symptoms of CMD during the age period studied has also been reported previously (49) but differs from the results found in early cross-sectional, epidemiologic studies (1, 2). An increase in the prevalence of awareness of oral parafunctions is also in line with previous results (49). It may be doubtful that the study can give a true value of the incidence of CMD/TMD. It is, however, important to try to increase the knowledge of the incidence rate and of the duration to understand the natural course of these disorders. When these subjects were 18 years old, the incidence of symptoms of CMD was 11%, and when

Table 2. Number (*n*), percentage distribution, and relative risk (*RR*) for reported symptoms (Ai) at the age of 28 years among cohorts. One cohort consists of those subjects who did not report any symptom of mandibular dysfunction during a 2-year period from the ages of 17 to 19 years; the second consists of those who reported symptoms once or twice at the ages of 17 to 19 years (occasional), and the third of those who reported symptoms at all three examinations (consistent)

	n	Ai 28 years	(%)	*RR*	*P*
Ai 17–19 years, women					
No symptoms	59	14	(24)		
Occasional symptoms	33	22	(67)	2.8	
Consistent symptoms	16	16	(100)	4.2	<0.0001
Ai 17–19 years, men					
No symptoms	81	17	(21)		
Occasional symptoms	21	9	(43)	2.0	
Consistent symptoms	5	3	(60)	2.9	NS

they were 19 years old, the incidence was 9% (34). Thus, incidence cases accounted for approximately one-third to nearly half of the total prevalence figure at these ages.

The study indicates different courses for symptoms of CMD in men and women. The prognosis for men was generally, and on a group basis, favorable, whereas women were much less likely to recover from their symptoms. The result may imply that gender should be one factor considered in making a decision about whether to start treatment. The result may also indicate that in studies aiming at an evaluation of possible perpetuating etiologic factors in the field of CMD/TMD, women and men should be studied separately.

As in most other epidemiologic studies, there was no great difference in the prevalence of symptoms of mandibular dysfunction between men and women on cross-sectional analysis. In the longitudinal perspective, however, the gender difference increased, showing that women as a group had a longer duration of symptoms than men, a factor that may be related to the higher

Table 3. Number (*n*), percentage distribution, and relative risk (*RR*) of reported symptoms (Ai) at the age of 28 years among cohorts. The first cohort consists of those who did not report fatigue in the jaws during the 2-year period from 17 to 19 years of age; the second consists of those who reported fatigue in the jaws at one or two examinations during the period (occasional), and the third of those who reported fatigue in the jaw at all three examinations

	n	Ai 28 years	(%)	*RR*	*P*
Fatigue 17–19 years, women					
No fatigue in the jaws	88	34	(39)		
Occasional fatigue	14	12	(86)	2.2	
Consistent fatigue	6	6	(100)	2.5	<0.01
Fatigue 17–19 years, men					
No fatigue in the jaws	101	26	(26)		
Occasional fatigue	6	3	(50)	1.9	
Consistent fatigue	–	–	–		NS

Table 4. Number, percentage distribution, and relative risk (*RR*) for the longitudinal development and reported symptoms (Ai) at the age of 28 years among cohorts with no reported temporomandibular joint (TMJ) sounds at the age of 17–19 years, TMJ sounds reported once or twice at the age of 17–19 years (occasional), and sounds reported at all examinations 17–19 (consistent)

	n	Ai 28 years	(%)	*RR*	*P*
TMJ sounds 17–19 years, women					
No reported TMJ sounds	75	27	(36)		
Occasional TMJ sounds	23	15	(65)	1.8	
Consistent TMJ sounds	10	10	(100)	2.7	<0.001
TMJ sounds 17–19 years, men					
No reported TMJ sounds	85	17	(20)		
Occasional TMJ sounds	18	10	(55)	2.7	
Consistent TMJ sounds	4	2	(50)	2.5	NS

proportion of women being referred for or seeking treatment because of pain, discomfort, and functional disturbances related to the TMJs, muscles, and jaws. Studies of patient samples have reported a long duration of symptoms among the patients (50–52).

Men who had symptoms in their late teens did not on group basis report more severe symptoms 10 years later; on the contrary, their general picture was that they recovered or reported milder symptoms (AiI). Among women and on a group basis no general progressive development of symptoms of CMD was found, even though some subjects had developed more severe, frequent, and intensive symptoms during the follow-up period.

The results of the study indicates that men and women have different courses of symptoms of CMD. In the long run men seem to recover to a greater extent than women, which indicates differences in duration of CMD between men and women and may imply, although this has not been studied, that because of a longer duration of CMD symptoms women are more likely to be referred to consultants and to TMJ-pain clinics than men.

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