

**Prevalence of troublesome symptoms related to  
temporomandibular disorders and awareness of bruxism in  
65- and 75-year-old subjects**

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Running title: TMD symptoms at age 65 and 75

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## **Abstract**

**Objective:** To assess the prevalence of 3 troublesome temporomandibular disorder (TMD) symptoms and awareness of bruxism in 2 cohorts of subjects aged 65 and 75 years.

**Background:** Epidemiological studies have demonstrated varying prevalence of TMD symptoms. The results concerning elderly people are inconclusive.

**Material and methods:** Identical questionnaires were in 2007 sent to all subjects born in 1942 and 1932 living in two Swedish counties. The response rate was 73.1% for the 65- and 71.9 % for the 75-year-old subjects, totally 9093 subjects.

**Results:** The great majority reported no or only few TMD problems. Less than 4 % considered their TMD symptoms to be rather great or severe. The mean prevalence of TMD-related symptoms and bruxism was greater in women than in men in both age groups. The 75-year-old women reported a marked lower prevalence of TMD symptoms and bruxism than the 65-year-old women, whereas the age differences were small among the men. Self-reported bruxism was associated with higher prevalence of TMD symptoms.

**Conclusions:** The great majority of the subjects did not report any troublesome TMD related symptoms. However, 5.4 % of the 65-year-old women and 3.8 % of the 75-year-old women considered their symptoms severe or rather severe.

**Keywords:** cross-sectional study, elderly, epidemiology, orofacial pain, questionnaire

## **Introduction**

Signs and symptoms of temporomandibular disorders (TMD) are common according to a number of epidemiological studies from many parts of the world<sup>1-4</sup>. The prevalence is low in children and increases during adolescence and young adulthood and seems to be highest among middle-aged subjects<sup>1,5-8</sup>. There is some confusion regarding the prevalence of TMD signs and symptoms among the elderly. Some studies reported increasing prevalence of TMD signs with aging<sup>9,10</sup>. On the other hand it has been demonstrated that elderly people tend to report less TMD symptoms when they get older<sup>11-13</sup>. A recent longitudinal epidemiological investigation found a slight increase of reported TMD symptoms from age 50 to 60<sup>14</sup>. In contrast to the varying results of TMD symptoms with increasing age, it is well established that the prevalence is higher in women than in men<sup>14-18</sup>. The preponderance of women, and particularly women in fertile age among patients seeking care for TMD problems, has been repeatedly demonstrated<sup>19-23</sup>.

The inconclusive results of the development of TMD signs and symptoms in elderly people shown in the literature inspired this investigation. The aim was to study the prevalence of 3 reported symptoms related to TMD and awareness of bruxism in large cross-sectional cohorts aged 65 and 75 years. It was hypothesized that the prevalence of TMD symptoms and bruxism would be lower in the oldest compared to the younger of these age groups.

## **Material and methods**

### *Population and response rate*

Identical questionnaires were in 2007 sent to all subjects born in 1942 (n = 8313) and in 1932 (n = 5195) living in the Swedish counties Örebro and Östergötland. The

response rate was 73 % for the 65-year-old subjects and 72 % for the 75-year-old subjects. The sex and age distribution of the 9 346 participants is presented in Table 1.

#### *Analysis of non-response*

A non-response analysis was done for gender and county for both age groups (65 and 75 years old) examined by questionnaire in 2007.

#### *Questionnaire*

The questionnaire comprised 53 questions, with altogether 123 items, and was originally described and discussed in a previous paper<sup>24</sup>. The questions were divided into socio-economic conditions (e.g. age, gender, occupation), general health (e.g. physician visits, tobacco habits, drug consumption), and oral conditions (e.g. satisfaction with teeth, oral problems, oral hygiene habits, number of teeth). In this study answers to 3 questions on TMD related symptoms and one to awareness of bruxism were analyzed. The questions were as follows: Do you have problems with: a) Pain from the TMJ region b) clicking or crepitation from the TMJs c) difficulties in wide opening, and d) grinding/clenching of teeth (in the following called bruxism). The four response categories were 1) no problems, 2) some, 3) rather great or 4) severe problem.

In a study using the same methods and questionnaire, clinical examination was performed in a randomly selected subgroup of the total sample (457 men and 484 women) in order 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<sup>25</sup>. The Ethics Committee in the Örebro and Östergötland region, Sweden, approved the original study in 1992 but depending on new regulations an approval of the study in 2007 by an ethical committee was not necessary.

### *Statistical methods*

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS, Release 14; SPSS Inc., 233 S. Wacker Drive, Chicago, Illinois 60606, USA) on an IBM Personal Computer. Mann-Whitney U test were used to analyze differences between groups). Logistic regression was performed to investigate associations between presence of TMD-related symptoms and different background variables. In the regression model, the following criteria were used for selection of independent variables: 1. theoretical relevance 2. significant variables between TMD symptom and background variables according to a Spearman correlation analysis<sup>14,24</sup>. The dichotomizations for the independent variables included in the logistic regression model are shown in Table 2. The dependent variable was 1) individuals having occasional or no TMD pain, opening difficulties or clicking ( $n_{65}=5596$ ;  $n_{75}=3285$ ) and 2) individuals with great or rather great problems regarding TMD pain, opening difficulties or clicking ( $n_{65}=246$ ;  $n_{75}=104$ ).

## Results

No significant difference between response and non-response groups was found concerning either gender or county of origin when the 2 age groups were taken together. However, there were significant gender differences when the age groups were analysed separately. In the 75-year-old group there were 46.8 % men and 53.2 % women in the response group while the corresponding numbers for non-response were 41.3 % and 58.7 %. In the 65-year-old group, there were 49.3 % men and 50.7 % women in the response group; the corresponding numbers for non-response were 53.3 % and 46.7 %. It was thus a difference between response and non-response group according to gender, controlled for age group, but no difference for county of origin.

### *Cross-sectional data*

*TMD symptoms.* Most responders were not aware of any TMD related problems.

Among those reporting any such symptom less than 4 % of the subjects considered any of them to be rather great or severe. However, there was evident difference between the sexes: 5.4 % of the 65-year-old women and 3.8 % of the 75-year-old women considered their symptoms severe or rather severe; the corresponding prevalences for the men were 2.9 % and 2.3 %, respectively.

The prevalence of the 3 reported troublesome TMD symptoms was higher in women than in men in both age cohorts (Table 1). The differences were significant for all 3 symptoms at age 65 ( $p < 0.001$ ) but only for TMJ pain ( $p < 0.01$ ) and opening ( $p < 0.001$ ) at age 75. The 75- compared to the 65-year-old women had significantly lower prevalence of TMJ pain ( $p < 0.001$ ) and TMJ sounds ( $p < 0.01$ ) but not of mouth opening ( $p = 0.1$ ). The older men reported less symptoms than the younger ones but the differences were not statistically significant.

*Awareness of bruxism.* The prevalence of awareness of bruxism was higher among

women than among men in both cohorts ( $p_{65} < 0.01$ ;  $p_{75} < 0.001$ ). The 75-year-old subjects of both sexes reported bruxism less frequently than the 65-old subjects (Table 1) ( $p < 0.001$ ).

#### *Cross-tabulation/Associations between TMD symptoms and awareness of bruxism*

The prevalence of problems to open the jaw wide and pain in the TMJ region was markedly (6 to 9 times) greater in subjects who did than in those who did not report problems with TMJ sounds (Table 3). The prevalence distribution was similar in both age groups but the prevalence of problems was higher among the 65- compared to the 75-year-old subjects.

Subjects in both age groups who reported bruxism exhibited a significantly higher prevalence of TMD symptoms than those who were not aware of bruxism (Table 4).

The distribution of the results was similar in both age groups although the prevalence was higher for TMJ sounds than for the other 2 symptoms.

#### *Logistic regression*

In both age groups reported bruxism exhibited by far the highest odds ratio (8.4 and 16.6, respectively) for having TMD related symptom. Other significant variables included minor health problems but none had an odds ratio above 3 (Table 5). Neither reported number of teeth nor presence of removable dentures was significantly associated with TMD related symptoms.

## Discussion

The main finding of the study was the relatively low prevalence of reported TMD symptoms in the investigated 65- and 75-year-old subjects. This is evident in comparison with reviews, which have found high prevalence, though with considerable variation, in many investigations mainly covering individuals of lower age<sup>1,26,27</sup>.

However, previous studies of elderly individuals have shown similar results of fairly low prevalence of TMD symptoms as in the present study. The prevalence of TMJ sounds among 70-year-old subjects in a Swedish study<sup>28</sup> and 76- to 86-year-old subjects in a Finnish study<sup>29</sup> was 13 % to 14 %; it varied between 11 % and 17 % among the 65 and 75 year old subjects in the present study. The proportion of subjects who considered their TMD symptoms rather great or severe was 2–3 % in all three studies. It deserves to be emphasised, however, that 5.4 % of the 65-year-old and 3.8 % of the 75-year-old women characterised their TMD as rather severe or severe, which of course is not a negligible prevalence.

The older subjects reported fewer symptoms than the younger ones but the differences between the age groups were small, especially among the men. The hypothesis that the prevalence of TMD symptoms would be lower in the older compared to the younger age group was partially verified. Awareness of bruxism was in both sexes lower among the 75- than the 65-year-old subjects, thus verifying the hypothesis.

Several studies of adults have found that women have more TMD problems than men<sup>1,14-17</sup>. In this study the women also reported more TMD symptoms than the men, but the differences were small and not always statistically significant. The results corroborate studies of elderly, which also have found only small and mainly non-significant differences in this respect between the sexes<sup>28,29</sup>. These findings indicate

that the often-emphasised sex difference regarding TMD symptoms is not generalizable to the oldest age groups.

The association between the three TMD symptoms studied was illustrated in the markedly higher prevalence of problems to open the jaw wide and pain in the TMJ region among those with, compared to those without, TMJ sounds (Table 3). Such an association between different TMD symptoms has been reported and discussed previously regarding adolescents and young adults<sup>6</sup>. If this association might be indicative of risk of more severe TMD problems in subjects with TMJ sounds cannot be assessed in this cross-sectional study. In this study of elderly people it can be assumed that several subjects had osteoarthrosis/osteoarthritis of the TMJ<sup>11-13</sup>. This can partly explain the relatively strong associations between TMJ sounds and problems with mouth opening and TMJ pain.

The conclusion from several longitudinal studies that joint clicking usually does not lead to locking or other severe problems<sup>6,30,31</sup> has been questioned because no differential diagnosis was made between the types of internal derangements of the TMJ causing the clicking. Recent studies have suggested that the prognosis differs and therefore differential diagnosis is necessary between types of internal derangement of the TMJ<sup>32</sup>. The design of the present large-scale epidemiological investigation did not make it possible to perform any differential diagnosis of the TMJ sounds. The results suggest however that presence of TMJ sounds should warrant an examination of other possible TMD symptoms.

Individuals who were aware of bruxism had a much higher prevalence of the 3 TMD symptoms (Table 4). The logistic regression further supports this association between TMD symptoms and bruxism by demonstrating that bruxism had much greater odds ratio than any of the other tested variables. This finding seems to indicate a positive

relationship between bruxism and TMD symptoms and corroborates results of several studies<sup>11,14,17,33,34</sup>. However, a number of other studies have questioned bruxism to be a major risk factor for TMD and orofacial pain<sup>35-37</sup>. The complexity of a possible relationship between bruxism and TMD is discussed in a new book on bruxism<sup>38</sup>. Some statements from two of the chapters deserve to be cited. “While it is clear that there are associations, one has to be cautious about inferring direct and simplistic causal relationships. One reason is the problem with operationalized definitions of bruxism”. ... “Craniofacial pain and bruxism should be managed as separate problems in individual patients”<sup>39</sup>. “To strengthen the case for causal relationships between TMD, bruxism, and stress, data need to be collected at multiple time points that are associated with the conditions under examination.” ... “It has been suggested, though, that these entities could coexist with bruxism without there being any causal relationships”<sup>40</sup>. To solve the enigma of the association between bruxism and TMD signs and symptoms more research is needed.

Another controversial and much-discussed issue is the role of occlusion in the aetiology of TMD<sup>41</sup>. This was not specifically investigated in the present study but there was no significant association between TMD symptoms and the reported number of teeth and presence or not of removable dentures. The self-report may seem to be a rough estimate of the real dental situation but a previous study using the same questionnaire demonstrated a good congruence between the recorded number of teeth in the questionnaire and at the clinical examination<sup>25</sup>. The dental status varied much but it deserves to be mentioned that the rate of edentulism (2.6 % and 7.8 % in the 65- and 75-year-old age groups, respectively) is extremely low in an international perspective<sup>42</sup>. The strength of this study is that it is based on large-scale population samples. The participation rates of 72 % and 73 % in the 2 cohorts would seem acceptable for an

epidemiological study at present. The total number of participants was 9 346. In previous studies using the same methods, non-response did not exhibit any serious deviations from randomness<sup>25</sup>. In the present study no significant difference between response and non-response groups was found concerning either gender or county of origin when the groups were taken together. However, there were significant gender differences when the age groups were analysed separately. The importance of this is difficult to assess but loss of participants always entails a risk to influence the results, and they should therefore be interpreted with some caution.

A limitation of the study is the design using a questionnaire. However, the validity of the method has previously been investigated and found adequate for large population samples<sup>24</sup>.

## **Conclusions**

The great majority of the 65- and 75 year-old subjects did not report any troublesome TMD related symptoms. The prevalence of reported TMD related symptoms and awareness of bruxism was higher in women than in men but the differences in the oldest age group were smaller than previously reported for younger people. The 75-year-old subjects of both sexes reported less TMD symptoms and bruxism than the 65-year-old subjects but in men the differences between the age groups regarding TMD symptoms were small. Subjects in both age groups who reported bruxism exhibited a markedly higher prevalence of TMD symptoms than those not reporting TMJ bruxism. In the logistic regression awareness of bruxism showed by far the highest odds ratio for TMD symptoms among the analysed variables.



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Table 1. Percentage distribution of reported symptoms related to TMD and awareness of bruxism in 2 cohorts of men and women examined at age 65 and 75 years

Reported symptom	Category	65 yr Women n = 2907	65 yr Men n = 2891	75 yr Women n = 1725	75 yr Men n = 1570
TMJ pain	No problems	86.0	92.0	89.9	92.7
	Some	11.4	6.8	8.2	6.4
	Rather great	1.8	0.8	1.1	0.7
	Severe	0.8	0.2	0.8	0.1
Difficulty in jaw opening	No problems	86.5	90.7	88.1	92.2
	Some	10.3	7.5	9.5	6.6
	Rather great	2.0	1.2	1.3	0.9
	Severe	1.1	0.6	1.0	0.4
TM joint sounds	No problems	82.8	88.2	86.8	88.5
	Some	14.5	10.6	11.6	10.4
	Rather great	1.9	1.0	1.1	1.0
	Severe	0.7	0.2	0.5	0.2
Bruxism	No problems	76.1	82.5	85.5	89.0
	Some	18.9	14.2	12.3	9.1
	Rather great	3.2	2.6	1.7	1.4
	Severe	1.8	0.7	0.5	0.4

Table 2. Dichotomisation of the independent variables used in the logistic regression (avståndet ökat mellan variabler och dikade variabler!)

Variable	Dichotomisation
Gender	1. Man 2. Woman
Social contact during a normal week	1= >3 people 2= 0-2 people
Place of birth	1. Sweden 2. Nordic/other country
Education	1. Elementary school 2. High school/college/university
Are you healthy	Yes/on the whole No/absolutely not
Marital status	1. Married, cohabiting 2. Unmarried/divorced/widow etc.
Use of medicine last 2 weeks	1. No 2. Yes
Smoking	1. Daily smoking 2. Remaining
Chewing all kind of food	1. Very good 2. Rather good, not so good, bad
When did you last experience toothache?	1. During the last three months/during the last year 2. >1 year ago/have never had toothache/cannot remember
Number of teeth	1. All teeth left/single missing 2. Rather many missing/almost none left/edentulous
Removable partial or complete denture	1. yes 2. No
Dry mouth - daytime	1=Yes sometimes, no seldom, never 2=yes often
Dry mouth - nighttime	1=Yes sometimes, no seldom, never 2=yes often

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Problems with a) wounds or blisters in the mouth, b) burning mouth; c) change of taste; d) sensitive teeth; e) bruxism; f) restorative materials	<ol style="list-style-type: none"> <li>1. No</li> <li>2. Some problems/rather many/great problems</li> </ol>
Satisfied with teeth	<ol style="list-style-type: none"> <li>1. Very satisfied/overall satisfied</li> <li>2. Not particularly satisfied/absolutely not satisfied</li> </ol>
Refrain from dental visit due to high cost during the last year	<ol style="list-style-type: none"> <li>1. No</li> <li>2. Yes, one or more times</li> </ol>
Satisfaction with dental care	<ol style="list-style-type: none"> <li>1. On the whole and very satisfied</li> <li>2: Rather and very dissatisfied</li> </ol>
Keeping teeth for life time	<ol style="list-style-type: none"> <li>1= Yes absolutely and probably</li> <li>2= No, probably not and absolutely not</li> </ol>

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Table 3. Cross-tabulation (%) of positive answers to two questions on troublesome TMD related symptoms with respect to troublesome TMJ sounds in 2 age cohorts.

		<u>Problems to open the jaw wide*</u>		<u>Pain in TMJ region*</u>	
		65-yr-olds	75-yr-olds	65-yr-olds	75-yr-olds
		(n = 5676)	(n = 3206)	(n = 5675)	(n = 3186)
Problems with TMJ sounds	No <sup>a</sup>	6.5	5.7	5.2	4.2
	Yes*	37.9	36.2	42.6	38.8

\*Some, rather many and great problems. <sup>a</sup>All 4 comparisons between No and Yes are significantly different ( $p < 0.001$ ).

Table 4. Cross-tabulation (%) of positive answers to three questions on troublesome TMD related symptoms with respect to problems with reported /awareness of bruxism in 2 age cohorts.

		<u>Problems to open</u>		<u>Pain in TMJ region*</u>		<u>Problems with TMJ</u>	
		<u>the jaw wide*</u>				<u>sounds*</u>	
		65-yr-	75-yr-	65-yr-	75-yr-	65-yr-	75-yr-
		olds (n =	olds (n =	olds (n =	olds (n =	olds (n =	olds (n =
		5665)	3212)	5648)	3185)	5634)	3182)
Problems	No <sup>a</sup>	7.4	6.7	6.0	5.8	10.4	9.0
with	Yes*	25.6	28.4	28.8	27.5	29.1	33.2
bruxism							

\* Some, rather many and great problems. <sup>a</sup> All 6 comparisons between No and Yes are significantly different ( $p < 0.001$ )

Table 5. Significantly correlated independent variables according to logistic regression (forward conditional method). The dependent variable was 1) individuals having occasional or no TMD pain, opening difficulties or clicking (n<sub>65</sub>=5596; n<sub>75</sub>=3285) and 2) individuals with great or rather great problem regarding TMD pain, opening difficulties or clicking (n<sub>65</sub>=246; n<sub>75</sub>=104).

Age group		95 % C.I.			
		for OR			
		Sig	OR	Lower	Upper
65 year	Female Gender	0.012	1.5	1.1	2.1
	Not feeling healthy	0.001	1.8	1.3	2.6
	Medicine intake last 2 weeks	0.041	1.5	1.0	2.3
	Chewing problems	0.002	1.7	1.2	2.4
	Burning sensation	<0.001	2.6	1.7	3.9
	Taste change	0.006	1.8	1.2	2.7
	Awareness of bruxism	<0.001	8.4	5.7	12.4
	Problem with restorative materials	0.004	1.8	1.2	2.7
	Sensitive teeth	0.027	1.5	1.0	2.1
75 year	Toothache during last year	0.036	2.1	1.0	4.3
	Blister	0.020	2.1	1.1	4.0
	Taste changes	0.003	2.8	1.4	5.6
	Awareness of bruxism	<0.001	16.6	7.6	36.4
	Drymouth - nighttime	<0.001	3.0	1.7	5.3
	Refrain from dental care due to cost	0.008	2.6	1.3	5.3
	Teeth will not last for lifetime	0.014	2.1	1.2	3.9