Studies on function and dysfunction of the masticatory system

IV. Age and sex distribution of symptoms of dysfunction of the masticatory system in Lapps in the north of Finland

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This paper gives the age- and sex distribution of symptoms of dysfunction of the masticatory system in 321 Lapps in Northern Finland. According to both an anamnestic and a clinical dysfunction index roughly the same prevalence of dysfunction was found among men as among women. The few sex differences which were found were small. Women had a significantly higher frequency of headache, pain in the neck and shoulders and fatigue of the jaws. On the average women had a worse dental state than men, who on the other hand reported luxations of the TMJ and some biting parafunctions more frequently than women. The age distribution was remarkably even for most of the recorded symptoms. General symptoms as headache, general joint and muscle symptoms, however, increased in frequency with age. For some of the anamnestic variables (oral parafunctions, feeling of fatigue of the jaws and facial pain) the age group 35—44 years showed the highest frequencies. The lowest frequencies of both anamnestic and clinical symptoms were found in the youngest age group (15—24 years). The findings in this study differ markedly from earlier studies on clinical materials reporting a skewed sex- and age distribution. The conclusion is that results from studies concerning age- and sex distribution of patients with functional disorders of the masticatory system, are not representative for the distribution of such symptoms in the general population.

Key-words: Temporomandibular joint syndrome; epidemiology, dental health surveys; rural population; pain

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In practically all investigations of functional disorders of the masticatory system in clinical materials a marked overrepresentation of women has been reported. 70—90 % of the patients examined have been women (*Campbell*, 1958; *Posselt*, 1962; *Franks*, 1964; *Perry*, 1968; *Carraro, Caffesse & Albano*, 1969; *Takada et al.*, 1971). No convincing explanation has been suggested for the preponderance of women in the series published, though interesting considerations have been

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offered by *Franks* (1964), *Kruse* (1965) and *Carraro et al.* (1969).

Good agreement between different series has also been found concerning the age distribution of patients with symptoms of dysfunction of the masticatory system. Most patients have been 20—40 years of age (*Franks*, 1964; *Voss*, 1964; *Carraro et al.*, 1969; *Takada et al.*, 1971). Some authors, however, have reported a predominance of patients between 40 and 50 years of age (*Perry*, 1968; *Gelb*, 1967). That functional disorders are not uncommon in still higher ages has been reported by *Hansson & Öberg* (1971), *Österberg & Hedegård* (1973) and *Agerberg & Österberg* (1974). Recent Swedish investigations suggest that the age distribution is much more even than hitherto shown (*Agerberg et al.*, 1970, *Carlsson & Svärdström*, 1971).

Also recent epidemiological investigations of disorders of the masticatory system suggest that the general assumption that such disorders are most common in young persons and then particularly in young women must be seriously questioned (*Helkimo et al.*, 1972; *Agerberg & Carlsson*, 1972; *Hansson & Nilner*, 1974).

Table I. *Age and sex distribution of entire material (n = 321)*

Age	Men	Women	Total
(1) 15 — 24 years ($\bar{x}$ = 19 years)	49	45	94
(2) 25 — 34 years ($\bar{x}$ = 31 years)	19	30	49
(3) 35 — 44 years ($\bar{x}$ = 40 years)	29	28	57
(4) 45 — 54 years ($\bar{x}$ = 50 years)	32	30	62
(5) 55 — 65 years ($\bar{x}$ = 61 years)	27	32	59
15 — 65 years	156	165	321

A previous paper (*Helkimo*, 1974a) reported the results of an epidemiological investigation of the occurrence of symptoms of dysfunction of the masticatory system in Lapps in the north of Finland. In both populations of Lapps studied the frequency of the symptoms was high. In the continued analysis of the findings indices were used for describing the degree of severity of dysfunction (*Helkimo*, 1974 b and c).

This paper concerns the age- and sex distribution of persons with such symptoms in that epidemiological investigation.

MATERIAL AND METHODS

The material consisted of 245 Skolt-Lapps and 76 Inari-Lapps examined in association with the international population genetic investigations of Lapps in the north of Finland in 1969—1970, which constituted part of WHO's 5-year International Biological Programme concerning the adaptation of human beings to arctic and subarctic environment (IBP/HA, *Lewin & Hedegård*, 1971).

The age and sex distribution of the material is given in Table I.

A careful history was taken of each individual, whose masticatory system was afterwards carefully examined clinically with routine methods used in the Department of Stomatognathic Physiology, University of Göteborg (*Carlsson & Helkimo*, 1972). For each individual an index was calculated which summarised the degree of dysfunction, as judged from anamnestic and clinical findings (an anamnestic and a clinical dysfunction index). The construction of the indices has been described in detail in a previous paper (*Helkimo*, 1974b). A summary is given here:

Anamnestic dysfunction index, A_i

A_iO denotes complete absence of subjective symptoms of dysfunction of the masticatory system (i.e. symptoms mentioned under A_iI and A_iII).

A_iI denotes mild symptoms such as temporomandibular joint (TMJ) sounds (clicking and crepitation), feeling of stiffness or fatigue of the jaws.

A_iII denotes severe symptoms of dysfunction. One or more of the following symptoms were reported in the anamnesis: difficulty in opening the mouth wide, locking, luxations, pain on movement, facial and jaw pain.

Clinical dysfunction index, D_i

D_iO denotes absence of the clinical symptoms, of which the index is built up.

D_iI denotes mild symptoms of dysfunction. 1—4 of the following symptoms were recorded: deviations of the mandible in opening and/or closing movement >2 mm from a straight (sagittal) line, TMJ sounds (clicking or crepitation), tenderness to palpation of the masticatory musculature in 1—3 palpation sites, tenderness to palpation laterally over the TMJ, pain in association with 1 movement of the mandible, maximal mouth opening 30—39 mm, horizontal movements 4—6 mm.

D_iII denotes at least one severe symptom combined with 0—4 mild symptoms or 5 mild symptoms only. The severe symptom may be any of the following: locking/luxation of TMJ, tenderness to palpation in 4 sites or more of the masticatory musculature, tenderness to palpation posteriorly of the TMJ, pain in 2 or more movements of the jaw, maximal mouth opening <30 mm, one or more horizontal movements <4 mm.

D_iIII denotes 2—5 of the severe symptoms possibly combined with any of the mild symptoms.

Statistical methods

In the statistical analyses of dependency between age, sex and symptoms the χ^2-test, test for trend in contingency table and Fisher's permutation test (*Odén & Wedel*, 1973) were used.

When statistically significant differences were found between age groups and between men and women, they are marked in the tables and figures with asterisks as follows:

$0.01 < p < 0.05$ (almost significant difference)*

$0.001 < p < 0.01$ (significant difference)**

$p < 0.001$ (highly significant difference)***

Differences that were not significant ($p > 0.05$) were not marked with an asterisk. For those variables where the right and left sides were recorded separately, the values found on the right side are invariably used in the tables (II—V).

RESULTS

Sex differences. The sex distribution of some anamnestic and clinical symptoms as well as some other data on the individual's oral status are given in Tables II

Table II. *Percentage distribution of general and local anamnestic symptoms in men and women*

	Women	Men	p
Number of persons	165	156	
Age ($\bar{x}$ years)	39	38	
General anamnestic symptoms	%	%	
Headache			
Never	25	36	
Occasionally	48	49	
At least twice a week	18	12	**
Every day	9	3	
Neck and shoulder pain	36	27	**
Pain in other muscles	8	12	
Pain in other joints	27	29	
Local anamnestic symptoms			
Fatigue of jaws	32	20	*
Facial and jaw pain	14	10	
Luxations of the TMJ	1	6	**
Chewing difficulties	40	35	
Parafunctions	39	45	
Clenching and grinding of teeth	20	23	
Tongue, lip or cheek biting	13	11	
Pressing of tongue	9	10	
Biting on objects	4	13	**

Table III. *Percentage distribution of muscle and TMJ symptoms and dentitional state in men and women*

	Women	Men	p
Muscle symptoms			
Tenderness of masticatory muscles to palpation	61	55	
Tenderness of the temporal muscle (right)	41	28	**
TMJ sounds			
Clicking	22	21	
Crepitations	15	8	
Anamnestic information of TMJ sounds	28	32	
State of dentition			
24—32 teeth	26	40	
Unilateral loss of molar teeth	5	6	
Bilateral loss of molar teeth	12	6	
Unilateral loss of molars + premolars	3	1	**
Bilateral loss of molars + premolars	7	11	
≤ 5 residual occluding pairs of teeth	9	16	
Single residual teeth/ edentulousness/complete dentures	39	22	
Occlusal interferences			
Interferences between RCP and IP	63	48	
The distance between RCP and IP > 2 mm	13	12	
Mediotrusion interferences	35	33	
Other intraoral observations			
Impressions of teeth in the tongue	17	8	*
Mucosal ridgings	14	15	

and III. Headache and pain in the neck and shoulders were reported somewhat more often by women than by men ($p<0.01$), while general joint and muscle symptoms were equally common in both sexes. The women reported tiredness more often than the men ($p<0.05$) while pain in the face and jaws was reported equally often by both sexes. Luxation of the temporomandibular joint was very uncommon but reported more often by men than by women ($p<0.01$). Parafunctions were equally common in both sexes, though biting of objects was somewhat more common among the men ($p<0.01$).

Tenderness of the masticatory musculature to palpation was slightly more common among the women, but the difference was significant only regarding the temporal muscle ($p<0.01$, Table III). Temporomandibular joint sounds were recorded anamnestically and clinically equally often in both sexes.

The status of the dentition was, on the average, poorer in the women than in the men, as judged from the number of residual teeth and the frequency of complete dentures (Fig. 1). 40 % of the

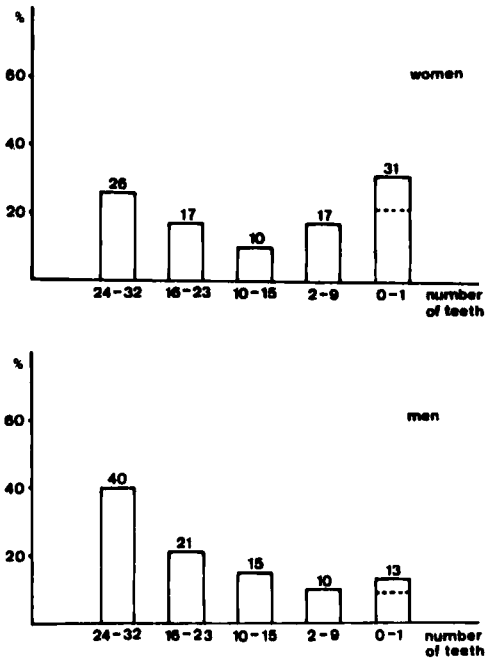

Fig. 1. State of dentition. Percentage distribution of number of teeth in men and women. The horizontal line in the last column denotes the frequency of complete denture wearers among the edentulous persons.

Table IV. *Percentage distribution of general and local anamnestic symptoms in different age groups (1—5)*

Factor	1 15—24	2 25—34	3 35—44	4 45—54	5 55—65	p
General anamnestic symptoms						
Headache						
Never	40	29	35	19	20	
Occasionally	55	45	35	55	53	
At least twice a week	4	22	23	16	19	**
Every day	1	4	7	10	8	
Neck and shoulder pain	5	25	42	52	51	***
Pain in other muscles	1	4	12	16	20	***
Pain in other joints	4	31	26	37	58	***
Local anamnestic symptoms						
Fatigue of jaws	18	22	40	29	32	**
Facial and jaw pain	10	2	23	14	15	*
Chewing difficulties because of						
extensive loss of teeth	4	22	28	40	40	***
poor fit of dentures	0	12	18	8	12	**
Parafunctions	31	31	51	33	32	*
Clenching and grinding of teeth	15	19	42	21	16	**
Tongue, lip or cheek biting	19	10	9	6	10	
Pressing of tongue	10	6	14	6	10	
Biting on objects	23	2	7	0	2	***

men had a complete set of natural teeth compared with only 26 % of the women. The frequency of complete dentures was twice as high for the women (21 %) as for the men (9 %). Interferences causing a lateral slide of the mandible between the retruded contact position (RCP) and the intercuspal position (IP) and mediotrusion interferences were about as common in both sexes (Table III). According to the anamnestic index, the number of individuals with subjective symptoms was equal in both sexes (57 and 56 %, respectively, Fig. 2). Severe symptoms (A_iII) were numerically more common in the men than in the women who thus had more mild symptoms, such as tiredness and feeling of stiffness of the jaws (A_iI). The differences were, however, small and not statistically significant.

The distribution of the scores (0, 1 and 5) for the five symptoms forming the basis of the dysfunction index differed only regarding mobility of the mandible,

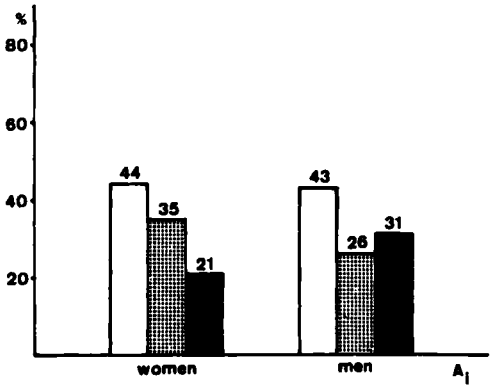

Fig. 2. Percentage distribution of anamnestic dysfunction index (A_i) in men and women. Unfilled column = A_iO = absence of subjective symptoms; dotted column = A_iI = mild subjective symptoms (TMJ sounds/stiffness/fatigue of the jaws); filled column = A_iII = severe subjective symptoms (facial pain/impaired mobility/pain on movement/locking/luxation).

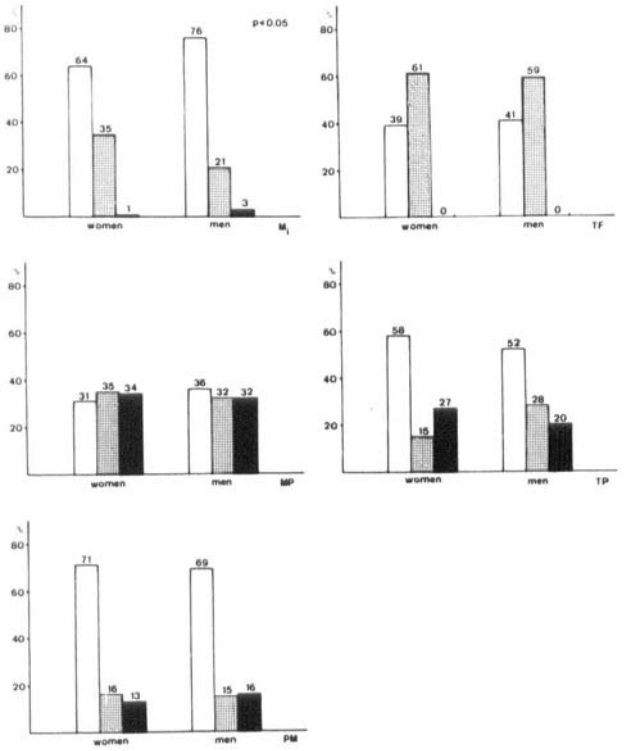

Fig. 3. Sex distribution of the scores for the five symptoms of which the clinical dysfunction index is built up. Mobility index (M_i), impaired TMJ function (TF), muscle pain (MP), TMJ pain (TP) and pain on movement (PM). Unfilled column = 0 points (absence of symptom); dotted column = 1 point (mild symptom); filled column = 5 points (severe symptom) according to the index system used.

which was somewhat more limited in the women than in the men ($p<0.05$, Fig. 3). Neither did the dysfunction index differ with sex (Fig. 4).

Age differences. The distribution of general joint and muscle symptoms reported as well as of headache is given in Fig. 5. All these symptoms were least common in the lowest age group. Particularly striking was the increase in frequency of general joint symptoms and symptoms referable to the neck and shoulder with increasing age ($p<0.001$). Tiredness of the jaws was reported most often in age group 3 (35—44 years), and least often in age group 1 (15—24 years; $p<0.01$). Pain in the face and cheeks was likewise most common in age group 3, but least common in age group 2 (25—34 years; $p<0.05$). The frequency of chewing difficulties was insignificant in the lowest age group, but increased markedly with age ($p<0.001$). The commonest cause of such difficulties was, according to the individuals, loss of teeth and poorly fitting dentures (Table IV).

Parafunctions were common in all age groups, but more common in age group 3 ($p<0.05$). The commonest parafunction was clenching and grinding of the teeth, which was reported more often in age group 3 than in the other groups ($p<0.01$). Tongue, lip and cheek biting was most common in age group 1, as was biting of objects (such as nails, pens, pipe stem, etc.). Impressions of the teeth in the margin of the tongue as well as mucosal ridgings were most common in the youngest individuals and least common in the oldest ($p<0.001$).

Masticatory muscles tender to palpation were noted in all ages with the significantly

lowest frequency in age group 1 (Table V). The frequency of tenderness of the neck musculature increased with age and the differences between the groups were significant for the trapezius muscle.

Temporomandibular joint sounds were noted in almost the same frequency in all age groups.

The state of the dentition became, on the average, poorer with advancing age. Practically all of the individuals with 24 teeth or more belonged to the lowest age group, who had, on the average, 25 teeth. But already in age group 2 almost half of the teeth had been lost ($\bar{x}$ = 13 teeth) and in the oldest group the average number of residual teeth was only 6 (Fig. 6).

Complete dentores, which were not worn by any members of the youngest group, were noted in about one out of every fourth individual in the other age groups.

Occlusal interferences of some sort were common and were noted in 71 % in the youngest age group and in about one third of the individuals in the other groups. The number of interferences which forced the mandible to one side or the other during the slide from RCP to IP did not differ significantly between the age groups, while mediotrusion interferences were noted most often (53 %) in the youngest group (Table V).

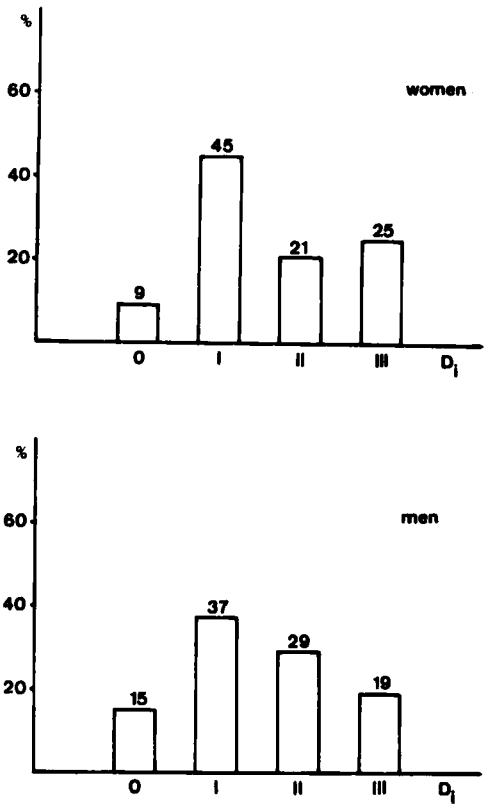

Fig. 4. Percentage distribution of clinical dysfunction index (D_i) in men and women. D_iO = no clinically demonstrable symptoms of dysfunction; D_iI = mild symptoms of dysfunction; D_iII = moderate dysfunction; D_iIII = severe dysfunction.

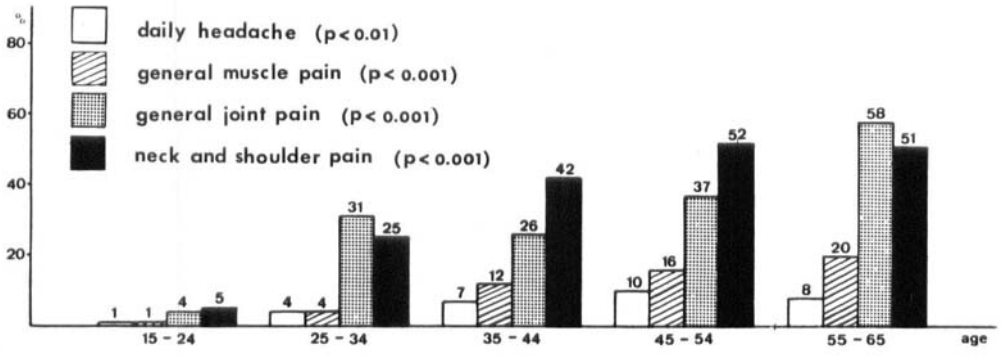

Fig. 5. Age distribution of reported general joint and muscle symptoms and daily headache.

Table V. *Percentage distribution of muscle and TMJ symptoms and dentitional state in different age groups (1—5)*

	1	2	3	4	5	p
Muscle symptoms						
Tenderness of masticatory muscles to palpation	43	63	68	67	68	*
Tenderness of temporal muscle	19	51	37	48	32	***
» of masseter muscle	9	22	26	10	19	*
» of digastric muscle	7	14	25	21	7	**
» of sternomastoid muscle	5	12	12	8	15	
» of trapezius muscle	6	8	16	18	29	**
TMJ sounds						
Clicking	13	20	26	28	24	
Crepitations	11	10	12	13	19	
Anamnestic information of TMJ sounds	26	31	39	25	32	
State of dentition						
24—32 teeth	88	20	4	8	0	
16—23 »	10	32	22	18	21	
10—15 »	1	9	15	25	21	***
2 —9 »	1	14	27	22	13	
0 —1 tooth	0	25	33	28	46	
Interferences (total)	73	68	70	66	61	
Interferences between RCP and IP	57	49	56	60	53	
The distance between RCP and IP > 2 mm	11	10	12	11	24	
Mediotrusion interferences	53	23	6	14	0	***
Other intraoral observations						
Impressions of teeth in the tongue	27	8	12	5	2	***
Mucosal ridgings	29	13	9	8	5	***

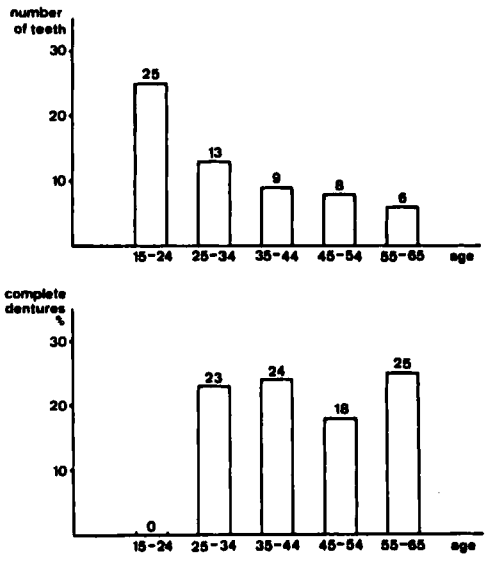

Fig. 6. Average number of teeth and frequency of complete dentures in both jaws in different age groups (n = 321).

Free-way space was smallest in age group 1 and increased with increasing age (Fig. 9).

The anamnestic dysfunction index showed the highest frequency of A_iII in age group 35—44, compared with the other groups, but the difference was not statistically significant (Fig. 7).

The age distribution of the scores for the five symptoms included in the dysfunction index differed significantly only regarding mobility index and muscle tenderness. Mobility index 5 (severely impaired mobility) increased with increasing age. Tenderness of the masticatory muscles to palpation was noted least often in the youngest group, but was otherwise roughly equally common in the other four age groups (Fig. 8).

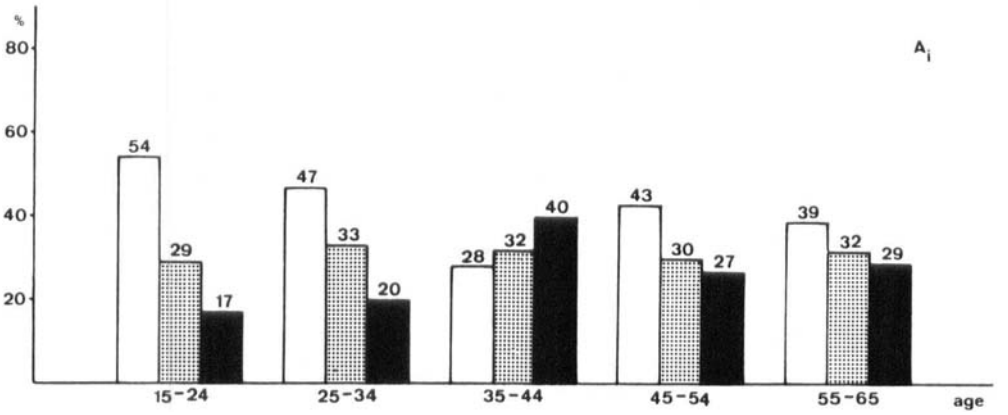

Fig. 7. Percentage distribution of anamnestic dysfunction index (A_i) in different age groups. Unfilled column = A_iO; dotted column = A_iI; filled column = A_iII.

The age distribution of the dysfunction index is given in Fig. 10. The lowest frequency of D_iIII was found in age group 1, which also comprised most of the symptomfree individuals.

DISCUSSION

Sex distribution. In contrast with previous investigations of patients with functional disorders of the masticatory system, the differences in frequency of the symptoms with sex in the present investigation were small and few. Thus, women complained somewhat more often of tiredness of the jaws and of headache than men. But the differences were by no means so striking as reported in studies of clinical materials.

Symptoms from neck and shoulders were also somewhat more common among the women, while general joint and muscle symptoms were roughly equally common in both sexes, as judged from the

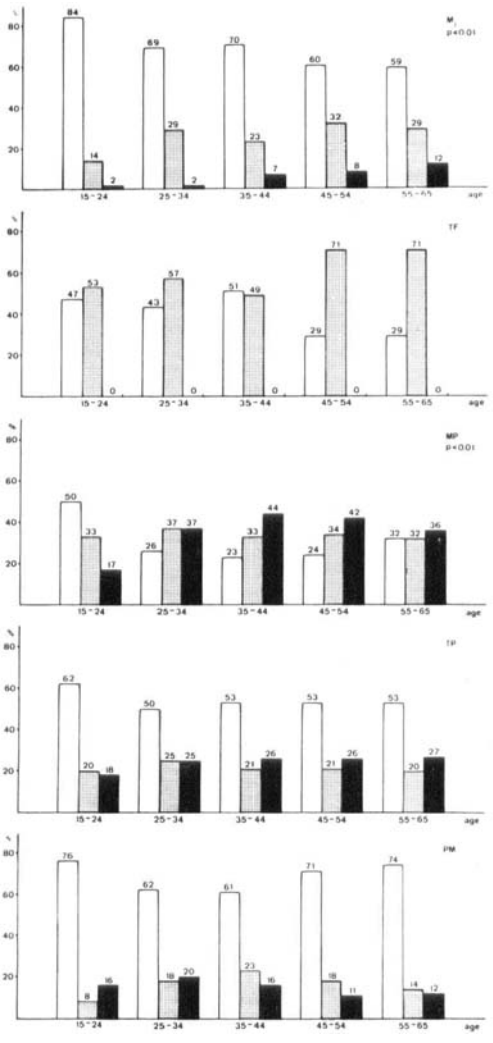

Fig. 8. Age distribution of the scores for the five symptoms of which the clinical dysfunction index is built up. Mobility index (M_i), impaired TMJ function (TF), muscle pain (MP), TMJ pain (TP) and pain on movement (PM). The columns are explained in Fig. 3.

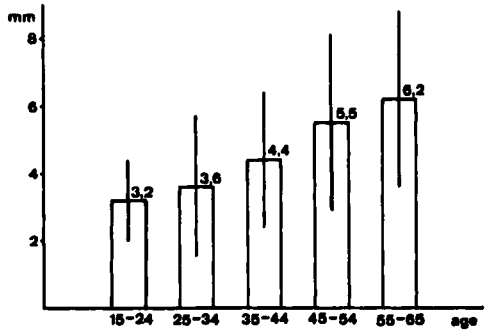

Fig. 9. Mean value and standard deviation of free-way space in different age groups.

anamnestic investigation. This equal sex distribution of general joint and muscle symptoms differed somewhat from what was found by *Agerberg & Carlsson* (1972) who in an investigation by questionnaire found that such symptoms were more common among women. Neither in their investigation, however, was the difference so large as might have been expected from earlier studies.

Pain of the face and jaws was equally common in both sexes, which differs clearly from what has been found in earlier clinical series where women were predominant (*Franks*, 1964; *Kruse*, 1965; *Carraro et al.*, 1969). Locking and luxations were uncommon, but were reported more often by men than by the women ($p<0.01$). In the present investigation the differences were probably due to the fact that the men probably were exposed more often to occupational trauma than women.

Neither the anamnestic index nor the clinical dysfunction index differed with sex. A moderate limitation of mandibular movements was, however, somewhat more common among women. Tenderness of the masticatory musculature to palpation was, broadly speaking equally common in both groups. These results argues against the view that the predominance of women in patients with TMJ dysfunction is so constant »that a key to the aetiology may be found here» as suggested by *Franks* (1964). Only the temporal muscle was more tender to palpation in women than in men, which might be related to the higher frequency of headache in the women. No endeavour was made to find out to what extent the headache reported was of myogenic nature (tension headache) or of any other form of headache. Certain comparisons between the results of the odontological examinations and of the general medical investigations of the

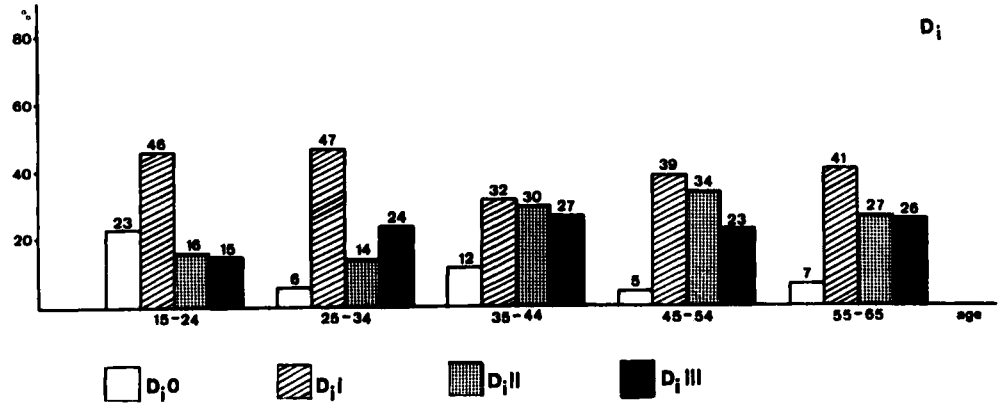

Fig. 10. Percentage distribution of clinical dysfunction index (D_i) in different age groups.

population are, however, in progress (*Lewin*, 1974, personal communication). But, the higher frequency of neck and shoulder pain in the women suggests that some of the headache might be of myogenic nature.

The state of the dentition was, on the average, poorer in the women than in the men, in that the women had fewer residual teeth and were more often denture-wearers. These findings agree largely with those reported in other epidemiological investigations of the state of the dentition in different populations in Finland (*Markkula et al.*, 1973) and in Sweden (*Willmar & Östlund*, 1965; *Smedby*, 1965; *Henriksson & Wictorin*, 1969; *Sjöberg & Ståhle*, 1972). Complete edentulousness or the existence of only one or two residual teeth (*i.e.* without prosthetic appliance) was likewise more common in the women than in the men in the present material, which contrasts with the average dental conditions seen in the population in Sweden (*Johansson*, 1970), where not compensated edentulousness is more common among men.

The findings in the present investigation thus differ markedly from those reported in clinical series with a striking unequal sex distribution regarding symptoms of dysfunction of the masticatory system. In the present investigation the sex distribution of symptoms was roughly equal. Some symptoms were even more common in the men than in the women. In view of the results of this epidemiological study it must be concluded that the sex distribution of TMJ symptoms in patients seeking treatment at specialist clinics are not representative of the population as a whole.

Age distribution. Judging from the anamnestic and clinical evaluation, functional disturbances of the masticatory system in the present material were largely the same in all age proups. This contrasts with the impression left by several clinical investigations regarding age distribution of patients with symptoms of dysfunction of the masticatory system. Most investigations report the patients to be mainly between 20—40 years of age, (*e.g. Franks*, 1964; *Voss*, 1964; *Kruse*, 1965; *Carraro et al.*, 1969).

In a few investigations a somewhat higher mean age has been reported (*Perry*, 1968; *Greene et al.*, 1969; *Carlsson & Svärdström*, 1971). For individual symptoms, however, interesting age differences are found. Thus, an increase in the frequency of headache and general muscle symptoms with age as reported by *Agerberg & Carlsson* (1972) could be confirmed. This is not surprising considering results of studies on geriatric materials, where general disease symptoms are found to be prevalent (*Hedegård & Markén*, 1970) and considering the cumulative effects of injuries and disorders during the span of life (*Osborne, Brill & Hedegård*, 1966).

Also chewing difficulties increased with age, which in this population was due mainly to the state of the dentition (number of teeth lost). In age group 2 (25—34 years) already half of the teeth had been lost and in the highest age group the individuals had, on the average, only 6 natural residual teeth, compared with 25 in the lowest age group. Already at 30 years of age edentulousness was a fact for about one fourth. These results agree well with what *Markkula et al.* (1973) found for the whole Finnish population. Compared to the population in Eastern and Northern Finland, however, there was a lower frequency of edentulous persons and denture-wearers among the Lapps, suggesting other dental behaviour — maybe as a consequence of geographical

isolation and difficulties in getting dental treatment. These problems are now being analyzed (*Hansson*, 1973). In other materials the loss of teeth has been found to increase more gradually with age (*Smedby*, 1965; *Johansson*, 1970; *Björn*, 1971).

The statement in many clinical investigations that functional disorders of the masticatory system are most common in younger individuals could thus not be confirmed in this population study. Several symptoms, such as tiredness in the jaws, tenderness of the muscles, temporomandibular joint sounds and reduced mobility of the mandible were even least common in the youngest group.

Parafunctions (clenching and grinding of the teeth, and pressing of the tongue), tiredness of the jaws and pain in the face and jaws were significantly more common in age group 3 than in the other age groups. Since no clear age differences in the dental conditions and in the occurrence of occlusal interferences (apart from the lowest age groups) could be demonstrated between the groups, occlusal factors cannot reasonably explain why certain anamnestic symptoms were more common in age group 3. An explanation might instead be sought in psychic factors. It is possible that members of this age group suffered more under the hardness of the times during and after the war, when they were in a mentally sensitive period (5—19 years), than the members of the other age groups. Many of the Skolt-Lapps in age group 3 were also those who after the end of the war had to build up a new Skolt-Lapp community in a foreign environment and at a time of transition between the old and new style of life which places hard claims on the adaptability of the individual. It is possible that social and psychological investigations of the population may shed light on this aspect of the problem.

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