Prevalence of some oral complaints and their relation to oral health variables in an adult Swedish population

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Thorstensson B, Hugoson A. Prevalence of some oral complaints and their relation to oral health variables in an adult Swedish population. Acta Odontol Scand 1996;54:257–262. Oslo. ISSN 0001–6357.

The aim of the study was to determine, in a randomly selected 20- to 70-year-old Swedish population, the prevalence of oral burning sensations and taste disturbances and their possible correlation to salivary factors, the presence of mandibular dysfunction, the prevalence of teeth, restorative procedures, caries and periodontal disease, and smoking habits. Of a total of 533 dentate individuals, 112 reported a total of 139 symptoms. Eleven of the 40 edentulous individuals reported a total of 14 symptoms. Burning sensations were reported by 18 (3.4%) of the dentate and 1 (2.5%) of the edentulous individuals. The symptoms of pricking and burning were significantly correlated to mandibular dysfunction and negatively correlated to the number of teeth. The symptom of bad taste was correlated to the number of amalgam-filled surfaces and to cigarette smoking. No other statistically significant correlation could be found. □ *Burning mouth syndrome; epidemiology, oral; taste disturbances*

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Burning and smarting sensations from the oral mucosa, sometimes accompanied by taste disturbances, are considered to be disorders of multifactorial etiology (1–3). In the study by Lamey & Lamb (2), approximately 30 of 150 patients with burning mouth syndrome (BMS) showed signs of mandibular dysfunction. In that study and in a clinical investigation by Main & Basker (4), various denture faults were considered to be of primary importance in the etiology of BMS. Another factor often associated with burning sensations and taste disturbances is a reduced salivary flow rate (2, 5), and from clinical experience it is well known that neglected oral hygiene, the presence of calculus and periodontal disease, and smoking are important etiologic factors of taste disturbances. Other possible causative factors of BMS are oral candidosis (6), pernicious anemia (7), vitamin B deficiencies (8), hormonal changes (9), and psychogenic disturbances (10–13).

Clinical studies and case reports have been published relating various oral complaints to toxic or allergic reactions to mercury from dental amalgam fillings (14–16). Also, possible harmful effects of galvanic currents between amalgam fillings or between amalgam fillings and other metal restorations, such as gold crowns, have been studied (17). The growing interest in the possible harmful effects of dental amalgam have also led many individuals themselves to suspect their amalgam fillings to be the cause of their oral mucosal burning and taste disturbances (18).

Epidemiologic studies on burning mouth sensations are sparse. In an English study of 392 patients attending a general practice, as many as 5.1% had oral burning sensations (9). Locker & Grushka (19) found that 4.5% of the respondents in a mail survey reported a prolonged burning sensation in the tongue or other parts of the mouth. No clinical examination, however, was performed to exclude pathologic changes in the oral cavity as a cause of the complaints. No epidemiologic studies concerning possible correlations between burning mouth sensations and other aspects of oral health have been presented so far.

The aim of the present study was to determine, in a randomly selected population, the prevalence of oral burning sensations and taste disturbances and their possible correlation to salivary factors, the presence of mandibular dysfunction, the prevalence of teeth, restorative procedures, caries and periodontal disease, and smoking habits.

Materials and methods

This investigation, part of a larger epidemiologic dental study in the community of Jönköping, Sweden, was based on data from 550 dentate and 47 edentulous individuals, who in 1983 had reached the ages of 20, 30, 40, 50, 60, or 70 years. The sample originally consisted of 130 individuals randomly selected from each age group. The number of non-responders, subjects examined, and their age and sex distribution are presented in Table 1. For details of the sampling procedure, the reasons for non-response, and so forth, see the articles by Hugoson et al. (20, 21).

Oral complaints

The investigation consisted of a questionnaire on oral

Table 1. Number of randomized individuals, non-respondents, and subjects examined

Age group	Randomized	Non-respondents	Dentate		Edentulous		Total
			Women	Men	Women	Men	
20	130	30	55	45			100
30	130	32	48	50			98
40	130	31	52	47			99
50	130	27	57	42	3	1	103
60	130	32	38	46	9	5	98
70	130	31	32	38	19	10	99
Total	780	183	282	268	31	16	597

health and dental care and a clinical and radiographic examination. The following questions in the questionnaire concerned the presence of daily intraoral symptoms:

Do you often (daily) experience intraoral symptoms such as 1) Pricking and burning sensations; 2) Metallic taste; 3) Salty taste; 4) Electric/battery taste; and 5) Bad taste.

Salivary factors

The rate of stimulated salivary secretion and buffering capacity (pH) was recorded. Before the start of the salivary sampling the participants chewed paraffin for 1 min and then swallowed the produced saliva. Stimulated saliva was then collected in a graduated glass cup, which was placed on ice, for 5 min or until at least 3 ml of saliva was collected. After collection the glass cup was sealed with wax. The secretion rate was read immediately (in ml/min). Buffering capacity was determined by the method of Ericsson (22) but with exclusion of the air stream step.

Mandibular dysfunction

Mandibular dysfunction was assessed by means of an anamnestic and a clinical dysfunction index (23); the occlusal state was evaluated with an occlusal index (23).

Prevalence of teeth and edentulousness

The number of existing teeth was recorded, as was the prevalence of edentulousness.

Table 2. The prevalences of five different oral complaints in dentate individuals: number with percentages of individuals in relation to the total number of women/men in each age group in parentheses

Age group (years)	Pricking/burning		Metallic		Salty		Electric/battery		Bad		Total
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	
20		1 (2)	1 (2)			1 (2)		1 (2)	11 (20)	3 (7)	18
30	1 (2)		4 (9)	1 (2)		1 (2)	1 (2)		6 (13)	5 (10)	19
40	2 (4)		6 (12)	4 (9)		1 (2)	2 (4)	2 (4)	13 (26)	4 (9)	34
50	6 (11)	1 (3)	3 (5)	4 (10)	2 (4)		3 (5)	3 (8)	14 (25)	3 (8)	39
60	6 (17)		7 (20)	3 (7)			1 (3)		3 (9)	3 (7)	23
70	1 (3)				1 (3)			1 (3)	1 (3)	2 (5)	6
Total	16 (6)	2 (1)	21 (8)	12 (5)	3 (1)	3 (1)	7 (3)	7 (3)	48 (18)	20 (8)	139
	18 (3)		33 (6)		6 (1)		14 (3)		68 (13)		
Missing values	8	9	7	9	7	9	7	9	8	9	

Table 3. Number of teeth and amalgam-filled surfaces in the symptom and non-symptom groups with respect to a) pricking and burning sensations; b) metallic, salty or electric/battery taste; and c) bad taste (Median (Md), range, and level of significance of differences between the two groups)

		No. of teeth			No. of amalgam-filled surfaces		
		Md	Range		Md	Range	
Pricking, burning	Yes	22	3–28	$p < 0.01$	24	0–54	NS
	No	26	2–28		25	0–72	
Metallic, salty, electric/battery	Yes	24	3–28	NS	30	0–51	NS
	No	26	2–28		24	0–72	
Bad taste	Yes	26	10–28	NS	29	0–62	$p < 0.05$
	No	26	2–28		24	0–72	

Caries and periodontal disease

The prevalence of secondary caries was recorded in accordance with the criteria stated by Koch (24). The presence of plaque corresponding to the criteria of the Plaque Index system (25) scores 2 and 3 and the presence of gingival inflammation corresponding to the criteria of the Gingival Index system (26) scores 2 and 3 were registered. Probing pocket depths equal to or exceeding 4 mm were registered, as was the presence of supra- and sub-gingival calculus.

Restorative procedures

All surfaces with amalgam or gold fillings were recorded. The presence of removable dentures was also recorded.

Smoking habits

The number of cigarettes per day and the use of pipe tobacco were recorded.

Statistical methods

The hypothesis of no differences in distribution between two groups was tested with the Mann–Whitney U test. When frequencies in discrete categories constituted the research data, the chi-square test was used to determine the difference between independent groups.

Table 4. Median (Md) and range of Plaque Index (PlI; %), Gingival Index (GI; %), periodontal pockets >4 (%), and supra- and subgingival calculus (%) in individuals with and without the symptom of bad taste

Bad taste	PlI	GI	Pockets	Supraging. calculus	Subging. calculus
Yes					
Md	26	16	8	10	0
Range	0–91	0–90	0–69	0–81	0–100
No					
Md	24	18	6	14	0
Range	0–100	0–100	0–100	0–100	0–100

Results

Eight men and nine women of the dentate individuals did not complete the questions on pricking and burning sensations and bad taste. For metallic, salty, and electric/battery tastes the corresponding figures were seven and nine. Of the edentulous individuals, five women and two men did not complete any of the questions. The total material therefore consisted of 533 to 534 dentate individuals (274 to 275 women and 258 men) and 40 edentulous individuals (26 women and 14 men).

The prevalences of the five different oral complaints and their age and sex distribution in the dentate individuals are presented in Table 2. One hundred and twelve individuals reported a total of 139 symptoms. The corresponding figures for the edentulous individuals were 11 and 14. Pricking and burning sensations were reported by 18 (3%) of the dentate and 1 (3%) of the edentulous individuals. A total of four individuals, three dentate and one edentulous, reported as many as three symptoms.

There was no statistically significant difference between individuals with and without symptoms with regard to rate of salivary secretion or buffering capacity.

The symptoms of pricking and burning were significantly correlated to the presence of mandibular dysfunction. Eleven of the 18 individuals (61%) with these symptoms reported CMD symptoms in accordance with Helkimo's anamnestic dysfunction index, whereas signs of clinical dysfunction were registered in 16 of these 18 individuals (89%). The corresponding figures for individuals without pricking and burning sensations were 129 of 514 (25%) and 269 of 515 (52%). Furthermore, the mean clinical dysfunction index value was 3.3 for the symptom group and 1.4 for the non-

symptom group. The presence of pricking and burning sensations was also correlated to the degree of occlusal dysfunction expressed as an occlusal dysfunction index value. The mean index values in the symptom and non-symptom groups were 6.4 and 4.4, respectively.

The number of teeth in the symptom and non-symptom groups is presented in Table 3. The number of teeth in the subjects with pricking and burning sensations was significantly lower than that in the symptom-free subjects ($p < 0.005$).

There was no difference between dentate and edentulous individuals with regard to the prevalence of any of the complaints.

The mean values of the Plaque Index, the Gingival Index, the percentage of deepened pockets, and supra- and sub-gingival calculus were not correlated to the symptom of bad taste (Table 4). Nor were there any correlations between the presence of secondary caries and the symptom of bad taste.

The number of amalgam-filled surfaces in the subjects who complained of bad taste was significantly higher than in the symptom-free subjects ($p < 0.05$) (Table 3).

The presence of approximal gold/amalgam contacts was not correlated to the symptoms of metallic, salty, and electric/battery taste. A total of 43 individuals reported such taste disturbances. Of these, 12 (28%) had 1–3 gold/amalgam contacts. The corresponding figures for the individuals without such taste disturbances were 163 of 507 (32%).

There was no difference in the total percentage of complaints when comparing dentate individuals with and without some kind of removable prosthesis.

The correlation between the presence of bad taste and cigarette smoking was statistically significant ($p < 0.05$). This correlation was stronger when individuals smoking less than 10 cigarettes per day were omitted.

Discussion

The individuals in this study constitute a random sample of Caucasians from the population of a medium-sized Swedish city.

The non-response rate of the questions studied was very low. It is likely that the individuals who did not answer the questions were symptom-free. It is therefore unlikely that the non-response rate would have any impact on the results.

Twenty-one per cent of these individuals reported one or more of the five oral complaints studied. Pricking and burning sensations were reported by 3.4%. This figure is in good agreement with Basker et al. (9), who found that 5.1% of 392 patients attending a general practice in England had oral burning sensations, and with Grushka (1), who found that 4.5% of the respondents in a mail survey reported such symptoms. With regard to other oral complaints it is well known that burning mouth sensations are often accompanied by various taste disturbances (27). No epidemiologic studies, however, can be found for comparison with the figures in the present study. From these few published epidemiologic studies it is obvious that burning mouth sensations are not very common in the general population but that other oral complaints can be found separately or in combination with burning symptoms in a surprisingly large proportion. From clinical experience we know that for some of these individuals the condition can be very disturbing and painful, and, thus, the treatment demand may be great in individual cases. Clinically, it is often difficult to establish causal relationships and thereby find effective means of treatment. Therefore, there is a great need for trying to ascertain more of the etiology of burning mouth symptoms and other oral complaints. From our own clinical experience and studies of the literature we have chosen some variables of oral health for correlation analysis with the five different oral complaints.

One hundred and seven of the total of 153 symptoms were reported by women. For pricking and burning sensations the female to male ratio was 8:1. For metallic taste and bad taste this ratio was approximately 2.5:1. The female dominance with regard to burning mouth symptoms is well-documented in the literature (2, 10, 28). The results in this study support previous investigations. No sex difference, however, was found regarding salty and electric/battery taste.

The presence of pricking and burning sensations was negatively correlated to the number of existing teeth. One possible consequence of losing teeth is a concomitant loss of occlusal stability and thereby a risk of increased muscular tension in the head and neck muscles including the tongue. The collected data on which this study is based do not contain information of the exact locations of the oral complaints. It is, however, possible that mechanical trauma from a shortened dental arch on a hyperactive tongue may contribute to the pricking and burning symptoms. This theory is supported by the finding that the individuals with pricking and burning symptoms reported more subjective symptoms in accordance with Helkimo's anamnestic dysfunction index. They also scored significantly higher on Helkimo's clinical dysfunction index. Furthermore, they had significantly fewer occluding teeth and more occlusal interferences than the symptom-free individuals. The findings are in good agreement with those of Lamey & Lamb (2), who registered tongue thrusting, clenching, and grinding in approximately 20% of 150 consecutive BMS patients.

Patients referred for investigation of oral galvanic phenomena often suspect their amalgam fillings of causing various general diseases and intraoral symptoms such as various taste disturbances. This was thoroughly described by Yontchev in his thesis from 1986 (29). In a study of a group of women in Gothenburg, Ahlqvist et

al. (30) could not find any correlation between the number of amalgam fillings and subjective symptoms and complaints. Nor could we, in this study, find a statistically significant correlation between the presence of metallic, salty, and electric/battery taste and the number of amalgam-filled surfaces. Nor was there a correlation to the presence of amalgam/gold contacts. These three taste sensations are taken together because they are similar and may have a common etiology. Theoretically, contacts between fillings could cause galvanic currents, which in turn might cause sensations like different taste phenomena. This has been described in an in vivo study of oral galvanism by Bergman et al. (31). The present study, however, lends no support to the belief that such taste disturbances are caused by the presence of amalgam fillings or approximal contacts between amalgam and gold.

The age groups 40, 50, and 60 years dominated for all symptoms. With regard to bad taste, however, a surprisingly large number of individuals were also found in the age groups 20 and 30 years. Except for this conflicting finding of many young individuals complaining of bad taste, the results from this investigation support those of previously published studies (2, 10, 28). The individuals with bad taste had significantly more amalgam-filled surfaces. The presence of amalgam fillings with defects such as pits and marginal discrepancies increases the risk of plaque retention and secondary caries development; possible taste disturbances might thereby appear. There was, however, no difference in either the plaque index or the prevalence of secondary caries between the individuals with and without bad taste. Furthermore, there was no difference in periodontal status, the presence of supra- and subgingival calculus, or salivary secretion and buffering pH. There was a strong correlation, however, between the presence of bad taste and cigarette smoking. This correlation was even stronger when those individuals smoking less than 10 cigarettes per day were omitted.

In this study the presence of removable partial or complete dentures did not bring about an increase in the prevalence of any of the registered oral complaints. This may seem surprising as the presence of dentures covering parts of the oral mucosa may increase the risk of trauma to the mucosa and of *Candida* infections and possible allergic reactions, which sometimes cause mucosal pain. This possibility is supported by Samaranayake et al. (6), who found that BMS patients had a higher prevalence of *Candida* species and coliforms than a control group. Eighty per cent of the patients had either full or partial dentures. In another study by Ali et al. (32), 5 of 22 BMS patients with full dentures were allergic to methyl methacrylate monomer, which in turn caused the burning sensations. The number of edentulous individuals and dentate individuals with some kind of removable prosthesis in the present study was, however, low, and no definite conclusions can be drawn.

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Received for publication 24 April 1995
Accepted 13 December 1995