

L. Hellqvist
M. Rolandsson
D. Birkhed
A. Hugoson

Tobacco use in relation to socioeconomic factors and dental care habits among Swedish individuals 15–70 years of age, 1983–2003

Authors' affiliations:

Lena Hellqvist, Margot Rolandsson,
 Department of Health and Environmental
 Sciences, Karlstad University, Karlstad,
 Sweden
Dowen Birkhed, Department of Cariology,
 Sahlgrenska Academy, University of
 Göteborg, Göteborg, Sweden
Anders Hugoson, School of Health Sciences,
 University of Jönköping, Jönköping, Sweden

Correspondence to:

Lena Hellqvist
 Karlstad University
 Department of Health and Environmental
 Sciences
 SE-651 88 Karlstad
 Sweden
 Tel.: +46 54 700 19 94
 Fax: +46 54 700 22 20
 E-mail: lena.hellqvist@kau.se

Dates:

Accepted 15 July 2008

To cite this article:

Int J Dent Hygiene 7, 2009; 62–70
 Hellqvist L, Rolandsson M, Birkhed D, Hugoson A.
 Tobacco use in relation to socioeconomic factors
 and dental care habits among Swedish individuals
 15–70 years of age, 1983–2003.

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Abstract: *Objectives:* The aim of this study was to describe the use of tobacco and changes in its use over time among individuals living in Jönköping, Sweden, and to analyse tobacco habits in relation to socioeconomic conditions, personality aspects and dental care habits. *Methods:* This study comprised three epidemiological cross-sectional studies, involving a random selection of individuals aged between 15 and 70 years, and was conducted in 1983, 1993 and 2003. The participants were asked to complete a questionnaire. *Results:* The results revealed a statistically significant reduction from 34% tobacco users in 1983 to 27% in 1993 and 28% in 2003. The main decrease was seen among smokers. At the same time, the number of users of snuff increased in all the age groups between 20 and 60 years of age. The use of tobacco was therefore largely unchanged in 1993 and 2003. In 2003, there was a statistically significant difference between users and non-tobacco users when it came to the frequency of dental visits; more tobacco users than non-tobacco users did not visit a dentist at all or did not visit a dentist regularly. In 1993, non-tobacco users brushed their teeth more frequently than tobacco users and this difference was statistically significant. *Conclusions:* During the 20-year study, there was a reduction in the number of smokers and an increase in the number of snuff users. There was a difference between tobacco users and non-tobacco users when it came to the frequency of dental visits and oral hygiene habits.

Key words: dental care habits; sense of coherence; smokeless tobacco; smoking; snuff; socioeconomic factors; tobacco

Introduction

The use of tobacco is one of the world's most serious social problems and its prevention is one of the greatest challenges for public health (1). The role of dental care in tobacco prevention is currently regarded as an increasingly important task. Regular visits to the dentist and dental hygienist provide an opportunity to follow up the use of tobacco in patients of all ages (2, 3).

A large number of studies have reported various medical side-effects of cigarette smoking (4–7). On the basis of the results of longitudinal studies in Europe, cigarette smoking has been shown to be one of the most common risk factors when it comes to dying from cardiovascular disease (4). The medical effects of snuff are not well described as those of cigarette smoking. Studies have shown that the users of snuff run a greater risk of dying from cardiovascular diseases and of developing high blood pressure (8, 9). Other studies have been unable to demonstrate this relationship (10). The use of Scandinavian moist snuff increases the risk of pancreatic cancer by 67% compared with the incidence among non-users (11).

The relationship between smoking and periodontal diseases is well documented and has been reported in a large number of studies (12–16). Changes to the oral mucosa caused by snuff are also well documented, together with the harmful effects on the periodontal tissues in the form of gingival recession (12, 13, 17–20). The relationship between smoking and caries and between the use of snuff and caries has not been studied on any large scale. In a study of female Swedish teenagers, a relationship was, however, demonstrated between tobacco use and high caries prevalence (21).

National surveys in Sweden have reported differences in smoking habits between different socioeconomic groups. The number of daily smokers among Swedish men has declined among both blue-collar workers with a low income and white-collar workers with a higher income. The reduction in cigarette smoking that has taken place among men has not been observed to the same extent among women in the occupational group comprising blue-collar workers with a low income. However, a reduction has been observed among female white-collar workers with a high income (22).

During the last few years, the number of men using snuff has increased among both blue- and white-collar workers. The number of female snuff users has also increased, even though no large differences can be seen in terms of income level (23). Studies conducted in Europe and the USA have also reported that smoking is more common among people with a low educational level and a low income than it is among people with a high

educational level and a high income (24–26). Another international study also reports that a high level of education and a high income are associated with a greater understanding of the health risks of tobacco (27).

Caries and periodontal diseases are multifactorial and, in addition to bacterial causes, oral health is also influenced by an individual's way of handling his/her oral hygiene, choice of food, use of fluoride and attitudes to health/ill-health (28–30). It is therefore important to attempt to understand the reasons for a person's behaviour. A person's sense of coherence (SOC) (31) has been shown to be related to that person's opportunity to respond to stress-related factors that arise in life, to resolve crises and make healthy choices. An understanding of SOC and the salutogenic concept can help dental professionals, as a complement to clinical data, when informing patients about oral preventive measures, for example. Antonovsky has constructed an instrument, a questionnaire, with the aim of measuring SOC in studies focusing on social and public health. When it comes to the use of tobacco, SOC has been used to predict an individual's future smoking habits. A study has shown that Hawaiian students who obtained a high SOC score were more frequently non-smokers than students with a low SOC (32). Other studies have not been able to demonstrate any connection between SOC and tobacco use (33–36).

Tobacco and eating habits and good oral hygiene are all examples of habits associated with lifestyle issues with a significant effect on both general health and oral health. A number of studies have demonstrated the positive effect of prophylactic programmes designed to influence the individual's knowledge and behaviour with the aim of promoting good oral health (28, 37–39). Regular visits to the dentist were also shown to have a significant impact on influencing and maintaining an individual's knowledge and behaviour in terms of oral health (40–42).

The aim of this study was to describe tobacco use and changes in its use over time (1983–2003) in a random selection of individuals aged between 15 and 70 years in Jönköping, Sweden, in relation to socioeconomic conditions, certain personality aspects and dental care habits.

Study population and methodology

The study population was taken from three epidemiological cross-sectional studies conducted in Jönköping, Sweden, in 1983, 1993 and 2003 (43). One hundred and thirty randomly selected individuals in each of the age groups, 15, 20, 30, 40, 50, 60 and 70 years of age, were asked to take part in an oral health examination. Of these, 704, 686 and 625 were examined

Table 1. Number of subject examined and sex distribution in each age group in 1983, 1993 and 2003

Age group	1983			1993			2003		
	Total	Female	Male	Total	Female	Male	Total	Female	Male
15	107	55	52	102	51	51	96	51	45
20	100	55	45	100	50	50	84	38	46
30	98	48	50	102	63	39	92	50	42
40	99	52	47	93	54	39	83	36	47
50	103	60	43	97	45	52	91	50	41
60	98	47	51	92	50	42	90	45	45
70	99	51	48	100	36	64	89	48	41
Total	704	368	336	686	349	337	625	318	307

in 1983, 1993 and 2003 respectively. The number of individuals distributed between age groups, gender and survey is shown in Table 1.

Not all the individuals who were invited to participate in the various examinations actually attended. Non-participants were contacted by phone and asked why they did not wish to take part. The number of non-participants was similar in 1983 and 1993 but was slightly higher in 2003. In 1983 and 1993, there were 15–25% non-respondents, whereas, in 2003, the number of non-respondents varied between 18% and 36% depending on the age group. Detailed information on the number of non-respondents and the reasons has been published previously (43).

A questionnaire was completed in conjunction with the oral hygiene examination. The questionnaire for 15-year olds comprised 23 questions, while the questionnaire for 20- to 70-year olds contained 101 questions. Edentulous individuals answered 68 questions. The same questionnaire was used for all three studies. Questions relating to ethnic background were added to the studies in 1993 and 2003. Among other things, the questionnaire contained questions of a demographic and socioeconomic nature, but it also included questions relating to medical and oral health history, dental habits, tobacco habits (cigarette smoking and use of Swedish snuff) and oral hygiene habits. Marital status and financial situation were also noted for the age group of 20 years and over. The participants' economic situation is divided into individuals with a low income before tax (2003 ≤ 25 000 euros) and individuals with a high income (2003 ≥ 25 000 euros). Since 1983, adjustments have been made according to changes in the consumer index. Occupational status is divided into employed (blue- and white-collar workers) and not employed (student, unemployed, pensioner and housewife/house husband). Educational level is described as low education (9-year compulsory schooling, practical upper secondary school) or higher education (upper secondary school, college of higher education). Marital status has been listed in

the age groups of 20–70 years as single and partner. Frequency of dental visits was described as every year, every other year and none of the years. Reasons for dental visits were also described as own initiative, dentist's initiative, influence by relatives and friends, relatives make an appointment, minor discomfort and/or pain and other reasons (43). Questions about oral hygiene were asked in relation to tooth brushing, twice or more per day, once a day and now and then. Smokers and snuff users were defined as daily smokers and snuff users. Participants who both smoked and took snuff were defined as mixed users.

In 2003, the original questionnaire was supplemented with Antonovsky's questionnaire, the SOC scale, relating to SOC in a Swedish version containing 13 questions (31). Only participants who answered all the questions in the questionnaire were included in this study. Every question was designed as a Likert scale with 1–7 points. As a result, each individual's total score could range from 13 to 91 points. A high score indicated a strong SOC.

Statistical analysis

The statistical analysis was conducted using SPSS (Version 13.0, SPSS, Inc., Chicago, IL, USA). The average values and frequencies were reported and calculations of statistical significance between variables and groups were made using chi-squared analyses. Multivariate stepwise logistic regression was performed in order to analyse the relationship between tobacco users and non-tobacco users as dependent variable and social variables (income before tax, occupational status, educational level and marital status). The relationship between regular dental visitors and non-visitors as dependent variable and social variables was also studied. The differences between tobacco users and non-users in terms of SOC scores were tested using Student's *t*-test. Continuity correction (44) was conducted to determine whether there was any difference in

Table 2. Percentage distribution of smokers and snuff users according to age and year of examination 1983, 1993 and 2003

Age group	Smokers			Snuff users		
	1983	1993	2003	1983	1993	2003
15	5	5	4	9	5	3
20	41	21	27	13	15	14
30	37	20	14	8	16	13
40	24	30	22	4	9	16
50	31	25	20	3	3	11
60	32	14	21	1	2	8
70	19	12	8	3	2	2
Total	27	18	16	6	8	10

the proportion of tobacco users between the different study years (Table 2). Statistical significance is given as $P < 0.05$.

Ethical considerations

This study complies with the ethical rules for research specified in the Declaration of Helsinki (45). The Ethics Committee at Linköping University, Sweden, approved the 2003 study (reference no: 02-376).

Results

Trends in use of tobacco, 1983–2003

Among the participants in the 1983 study, 34% of the sample was tobacco users (smokers, users of snuff and mixed users). In 1993 and 2003, the percentage was 27% and 28% respectively. There was a statistically significant difference ($P < 0.001$) in terms of total tobacco use between 1983 and the 2 years, 1993 and 2003. Use of tobacco was higher in 1983 than in the other 2 years. The percentage of tobacco users in

relation to age and study year is shown in Fig. 1. In all the age groups, apart from 40-year olds, the percentage of users was higher in the 1983 study than in the studies in 1993 and 2003. In the 1983 study, the highest percentage was found among 20-year olds (57%), whereas in the studies in 1993 and 2003 the highest percentage of tobacco users was found among 40-year olds (41%) and 20-year olds respectively (46%). In all the studies, the percentage of tobacco users was lowest among 15- and 70-year olds.

The percentage of tobacco users distributed between study year, age, smokers and users of snuff is shown in Table 2. In all three studies (except in 15-year olds in 1983), smoking was more frequent than the use of snuff. The total percentage of smokers decreased successively from 1983 (27%) to 1993 (18%) and 2003 (16%). The reduction was statistically significant ($P < 0.001$) between 1983 and the last two study years. The total percentage of male and female smokers was more or less the same in the different cohorts. As a result, the decline was the same for men and women between 1983 and 2003. The percentage of snuff users increased from 6% in 1983 to 10% in 2003 ($P < 0.01$).

Tobacco users also included participants with mixed use, smokers and users of snuff. The percentage of mixed users was 1% in 1983 and 1993 and 2% in 2003. Mixed use was most common in the 20-year-age group and it increased during the study period from 3% in 1983 to 4% in 1993 and 5% in 2003.

Smoking and snuff habits in different age groups and between genders

In 1983, the total percentage of smokers among 15-year olds was lower (5%) than the total percentage of users of snuff

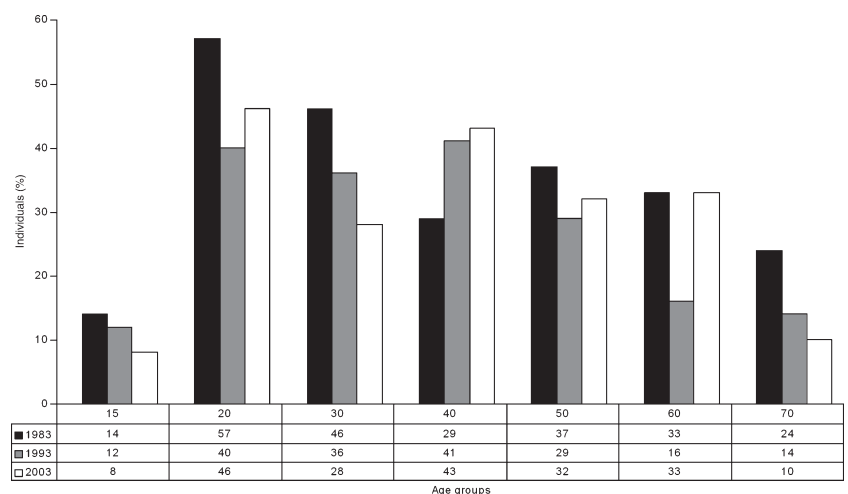


Fig. 1. Percentage distribution of tobacco users in relation to age in 1983, 1993 and 2003.

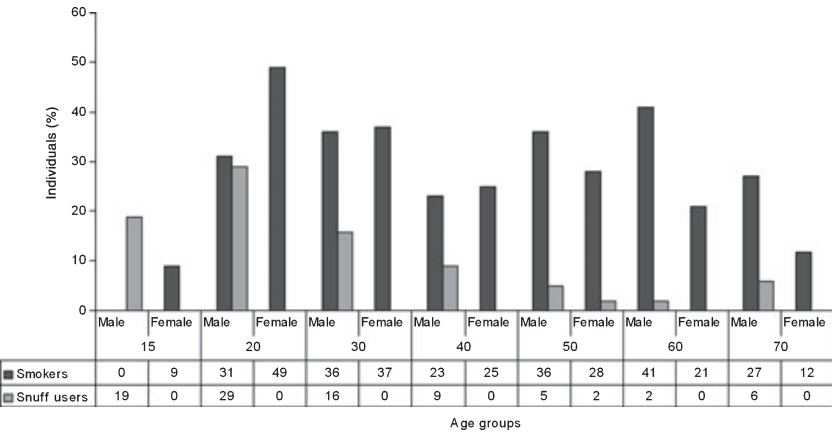


Fig. 2. Percentage distribution of smokers and users of snuff among men and women at different ages in 1983.

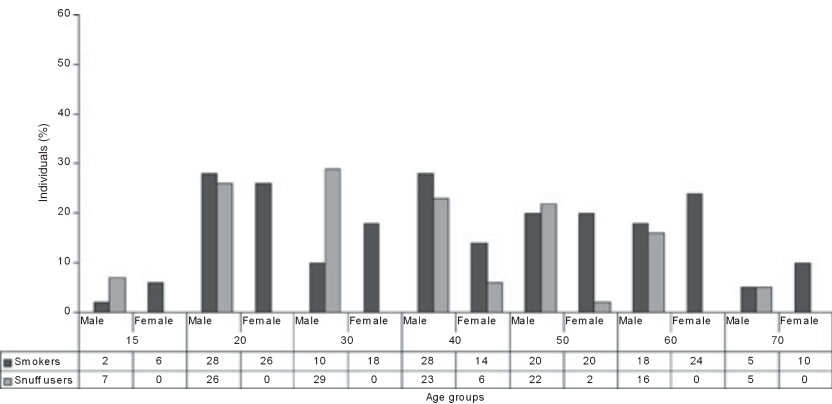


Fig. 3. Percentage distribution of smokers and users of snuff among men and women at different ages in 2003.

(9%) (Table 2). In 1993, the total percentage of smokers and users of snuff among 15-year olds was 5% for both groups. Among 20-year olds, the percentage of smokers decreased from 41% in 1983 to 27% in 2003. The percentage of users of snuff among 20-year olds was unchanged during the study period. The percentage of smokers declined in the all age groups between 1983 and 2003, while the percentage of users of snuff increased in the 20–60 age groups.

Figures 2 and 3 show the percentage distribution of smokers and users of snuff among men and women in the study years 1983 and 2003. In 1983, there were no smokers among 15-year-old males, while 9% of the females smoked. On the other hand, 19% of the males used snuff, while none of the females did. The highest percentage of smokers was found among 20-year-old women (49%), but there was also a large percentage of smokers among 60-year-old men (41%). The highest percentage of snuff users was found among 20-year-old men (29%). In 2003, 2% of 15-year-old males and 6% of females stated that they were smokers. Among 20-year-old men, 28% were smokers and 26% used snuff. In the age

groups 40–60, the percentage of men using snuff increased in comparison with previous study years.

Socioeconomic factors

There was no statistically significant difference in the different study years between low and high income earners and low and high educational levels when it came to the use of tobacco. In the study in 1983, the percentage of tobacco users among low income earners was 27%, while it was 35% among high income earners. In 2003, the percentage of tobacco users was 23% among low income earners and 21% among high income earners.

In 1983, 35% of tobacco users had a low educational level and 34% had a high educational level. In 2003, the percentage of tobacco users with a low educational level was 24%, while the corresponding figure for a high educational level was 25%.

No statistical differences could be demonstrated in terms of tobacco use and marital status in 1983 and 1993. In 2003, a statistically significant difference ($P < 0.005$) was found between tobacco users and non-users regarding marital status.

Use of tobacco was higher among single men compared with men living in a partnership.

Aspects of oral health behaviour

No statistically significant difference could be demonstrated between tobacco users and non-users in terms of SOC scores, mean value 65.1 points (SD = 19.4) and mean value 63.8 points (SD = 23.3) respectively. Tobacco users who used both cigarettes and snuff (13 individuals) had a mean value of 60.0 points (SD = 23.8) compared with non-users who had a mean score of 63.8 points (SD = 23.3). The difference was not statistically significant.

Dental visits

No statistically significant difference could be demonstrated between tobacco users and non-users in the 20–70 years age group in study years 1983 and 1993 when it came to annual visits to the dentist. Among tobacco users in 1983, 82% visited a dentist every year, while the corresponding figure among non-tobacco users was 83%. In the 1993 study, 82% of tobacco users and 86% of non-users stated that they visited a dentist every year. In the 2003 cohort, there was a statistically significant difference between tobacco users and non-users regarding the frequency of dental visits, as more tobacco users stated that they did not make regular visits to a dentist. The distribution of dental visits between tobacco users and non-users in 1983, 1993 and 2003 is presented in Table 3.

The lower utilization frequency of dental care was analysed using multiple stepwise regression analysis. There was no association between the utilization frequency and social variables.

Reasons for dental visits

The most common reason for dental visits was on the initiative of the dentist. In all three cohorts, 70–82% of the participants answered that they visited a dentist on the initiative of the dental service. There was a non-significant difference between tobacco users and non-users with respect to reasons for dental visits.

Oral hygiene habits

Table 4 shows the tooth-brushing habits distributed between tobacco users and non-users in 1983, 1993 and 2003. Most tobacco users and non-users brushed their teeth twice a day. In 1983 and 2003, no statistically significant difference could be demonstrated in terms of tooth-brushing frequency. In 1993, however, there was a statistically significant difference in terms of tooth-brushing frequency, which was higher among non-tobacco users compared with tobacco users. In 1983 and 2003, there was a statistically significant difference in terms of regular use (every day) of toothpicks ($P < 0.000$ respectively $P < 0.039$) between tobacco users and non-tobacco users. The use of toothpicks was higher among non-tobacco users compared with tobacco users. In 1993, no statistically significant difference could be demonstrated between tobacco users and non-tobacco users.

Discussion

This report should be seen as the first in a series of studies designed to spotlight the effect tobacco use has on oral health. The principal aim has been to provide an overall picture of

Table 3. Percentage distribution of tobacco users and non-users according to frequency of dental visits in 1983, 1993 and 2003

	1983		1993		2003	
	Tobacco user	Non-user	Tobacco user	Non-user	Tobacco user	Non-user
Every year	82	83	82	86	62	71
Every other year	10	8	12	11	20	19
None of the years	8	9	6	3	18	8

Table 4. Percentage distribution of tobacco users and non-users according to tooth-brushing frequency habits in 1983, 1993 and 2003

	1983		1993		2003	
	Tobacco user	Non-user	Tobacco user	Non-user	Tobacco user	Non-user
Tooth-brushing frequency						
Twice or more per day	89	91	80	90	87	90
Once a day	11	8	18	8	9	7
Now and then	0	2	2	1	4	1

the tobacco user as a person in relation to the non-tobacco user in terms of socioeconomic conditions, personality aspects and some dental care habits, frequency of dental visits, reasons for dental visits and oral hygiene habits. This comparison covers a time period of 20 years.

Data from epidemiological studies can be used to illustrate a number of important subjects, such as the incidence of dental disease, and to identify and analyse disease determinants and groups risking a deterioration in oral health. The results of epidemiological studies can be used primarily to evaluate preventive action in the population such as programmes to reduce tobacco use.

The results presented in this study, as regards the use of tobacco, are based on three epidemiological studies of a random selection of the population in Jönköping, a medium-sized Swedish city. The results relating to the use of tobacco are in agreement with the results of other national studies (22, 23, 46), which also indicates that results relating to tobacco use can be more generalized. On the other hand, national surveys have also revealed that there are significant regional differences in tobacco use (22, 23).

The data were collected using a questionnaire with a limited number of alternative answers and only a restricted opportunity for the participant to give his/her own comments and opinions. This design is a prerequisite for the statistical processing of the results, but it also results in limitations when it comes to obtaining detailed answers. Some questions can be misunderstood and may therefore lead to incorrect conclusions. When it came to the use of tobacco, the participants were asked about this in connection with the clinical examination and this therefore provided an opportunity for follow-up questions. On the other hand, it also created a risk that the person conducting the examination would have a greater impact on the participant's answers.

The non-respondent rate from the studies in 1983 and 1993 was 15–25%, depending on age group, whereas it was 18–36% in 2003. The reasons for being unable or unwilling to participate were lack of time or interest and this applied particularly to 30- and 40-year olds. There is therefore a tendency in our current society for people to be unwilling to take part in different studies and this could be due to the high tempo in people's daily lives. It is difficult to determine whether the non-respondents have influenced the results in some way. There were several different reasons why people were unwilling to take part and this indicates that non-respondents are not likely to have had a major impact (43, 47).

The use of tobacco changed during the 20-year period, as the number of tobacco users declined from 34% in 1983 to

27% in 1993 and 28% in 2003. So the reduction in the percentage of tobacco users took place during the first 10-year period, after which the percentage of tobacco users was unchanged. When it came to the percentage distribution of tobacco users in the different age groups, large differences could, however, be demonstrated between the different cohorts. For example, the use of tobacco decreased by almost 50% among 15-year olds between 1983 and 2003. A substantial decline in tobacco use also took place among 20-year olds between 1983 (57%) and 2003 (46%), even though this was the group with most tobacco users in both study years. Among 30-year olds, a large reduction in tobacco use also took place over time. On the other hand, tobacco use increased among 40 year olds.

The following clear-cut trend can therefore be seen; the total number of tobacco users is decreasing over time, but it is especially important to note that it is the number of smokers that is decreasing. The reduction that has taken place in the number of cigarette smokers can be due to two things – fewer and fewer people are starting to smoke and many people are giving up smoking.

When it comes to the use of snuff, this has increased in certain age groups, particularly among men but also among women. This could be due to some smokers switching to snuff. One of the reasons why more and more people are switching from smoking to snuff could be that it has not been proved as conclusively that snuff is as harmful to general health as smoking. Having previously been a male habit, the use of snuff has now also increased among women. This has also been revealed in other Swedish studies (23).

No statistically significant difference could be demonstrated between tobacco users and non-users when it came to SOC scores. A clear-cut relationship with SOC has been demonstrated in other studies (33–36). It has, however, been demonstrated in other studies conducted on students and middle-aged men that SOC can have an impact on whether an individual starts using tobacco, as well as the healthy choices people make in life (32, 48).

The frequency of dental visits has changed over time to keep pace with the changes in the dental service's and general public's attitude towards the importance of regular checkups and the fact that economic and staff resources have been created within dental care to meet the increasing demand from the general public, not least for measures of a preventive nature. In 1973, dental insurance for the adult population was introduced in Sweden. Having only previously sought dental care when it was necessary during the 1970s, some 80% of the people examined in 1983 stated that they had been summoned

for a checkup by the dental service. In 1993 and 2003, an even larger percentage stated that they visited a dentist on the initiative of the dental service.

The World Health Organisation also stresses the preventive responsibility of dental health care regarding tobacco. Through oral health programmes it aims to control tobacco-related oral diseases and adverse conditions (49). Professional dentists and dental hygienists in Sweden are positive about taking part in tobacco preventive work. However, a larger percentage of tobacco users than non-tobacco users did not visit a dentist at all or only visited a dentist at irregular intervals, indicating that tobacco users failed to take advantage of the opportunity for health promotion and tobacco prevention information.

Oral hygiene habits were examined and a statistically significant difference was demonstrated between tobacco users and non-tobacco users when it came to the frequency of daily tooth brushing. Tobacco users did not brush their teeth as frequently as non-tobacco users, thereby taking the inherent risk of a deterioration in oral hygiene and a subsequent deterioration in oral health.

To summarize; the results of this study show how tobacco use has changed in Sweden over the past 20 years, but they also reveal that tobacco users differ in some respects from non-tobacco users in terms of dental visits and oral hygiene habits, which could have an impact on oral health.

Acknowledgements

We wish to thank Dr Birgit Ljungqvist for her valuable assistance with the statistical analyses. We are grateful to the Council for Medical Tobacco Research in Stockholm for financial support. There is no commercial or other relationship that constitutes a conflict of interest.

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