

# Tobacco habits among teenagers in the city of Göteborg, Sweden, and possible association with dental caries

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## ABSTRACT

From nine dental clinics within the Public Dental Service in the City of Göteborg, 2145 patients aged 14 to 19 answered a questionnaire concerning their tobacco habits. Tobacco was used in some form by 27 per cent of the patients and use increased with age. Smoking was more common among girls than among boys: 24 and 12 per cent, respectively. The statistical analyses showed that smoking as a habit and an increased number of cigarettes smoked per day are positively correlated with increases in the number of decayed, missing and filled teeth and the number of initially decayed proximal surfaces. Further, all caries epidemiological data were significantly higher among patients with tobacco habits compared to non-users. It can be concluded that there is a correlation between the tobacco habit and increased caries prevalence. However, dietary and oral habits have to be further elucidated before any definite conclusions can be made regarding the effect of the tobacco habit *per se* on the development of caries.

## SAMMANFATTNING

2145 patienter i åldrarna 14 till 19 år från nio olika kliniker i FTV i Göteborg besvarade ett frågeformulär rörande deras tobaksvanor. Tobak användes i någon form av 27 procent av patienterna. Rökning var vanligare hos flickor än hos pojkar, 24 respektive 12 procent. Den statistiska analysen visade att en positiv korrelation förelåg mellan de kariesepidemiologiska värden för DMFT, D1p och rökvanor och även med antalet per dag rökta cigaretter. Vidare var samtliga karies epidemiologiska data signifikant högre hos patienter med tobaksvanor än med de utan vanor. Sammanfattningsvis kan sägas det föreligger samband mellan nyttjande av tobak och en ökad karies prevalens. Emellertid måste inverkan av matvanor och oral hygien för dessa patienter bli föremål för utvärdering innan tobakens effekt *per se* på kariesutvecklingen kan bestämmas.

## INTRODUCTION

The general effects on the body of tobacco consumption are well established. The asso-

ciation between tobacco habits and cancer, myocardial infarction, peripheral vascular

disease and chronic obstructive lung disease is well known and has attracted much research.

There are also well defined local effects of tobacco in the oral cavity, i.e. lesions such as leukoplakia, erythroplakia, squamous cell carcinomas, smokers palate and increased melanin pigmentation (for review see *Preber* 1986). Snuff dipping induces typical lesions, often premalignant or malignant, in the oral mucosa at the site of application of the quid (for review see IARC, 1985).

Tobacco contains approximately 2500 different chemicals, with varying biological effects. The possible confounding effects of these chemicals on oral diseases have not been fully investigated. However, the association between periodontal disease and tobacco smoking has been established (*Ismail* 1983, *Preber* 1986), while use of snuff only has been reported to have an effect on the tooth supporting tissues, exactly related to the place where the quid is placed (*Hirsch et al* 1982, for review see IARC 1985, *Mörnstad et al* 1989).

The effect of tobacco habits on the development of dental caries has not yet been subjected to any thorough discussion (for review see IARC 1985, US Dept of Health and Human Services, 1986).

It is obvious that the sooner we start using tobacco the greater is the risk for long use and also for injurious effects of different kinds. Thus it is of utmost interest to know

the frequency of tobacco use among young people. The aim of this study was to screen the tobacco habits of individuals 14 to 19 years of age in the City of Göteborg, Sweden, and to analyze the caries epidemiological data with regard to possible association with tobacco use.

## MATERIAL AND METHODS

In nine public dental clinics in Göteborg, with a total number of 7083 patients aged 14 to 19, 2167 individuals (Table 1) were asked to answer questionnaires regarding tobacco habits, in connection with their yearly dental check-up during the year 1986. The total number of patients in the City of Göteborg aged 14 to 19 were around 21.000. The nine clinics were chosen in the central part of the City, with its middle class population in order to select patients with good dental health.

After that the dental check-up was finished, each patient was asked to fill in the questionnaire, regarding their past and present tobacco habits, frequency, type or types and amount of tobacco used and the number of years with the tobacco habit.

The patients answering the questionnaire were divided into two main groups - tobacco users and non-tobacco users. The tobacco using group was further divided into subgroups according of the type of tobacco habit such as smoking or snuff dipping and a group of former users. From the dental files, which

Table 1. The total number of teenagers in each age group in the nine clinics in the City of Göteborg and the number of individuals asked to answer and those answering the questionnaire, respectively.

Age	Total number of patients	Number of patients asked to answer the questionnaire	Number of patients answering the questionnaire
14	1.134	141	137
15	1.183	397	394
16	1.115	393	385
17	1.075	396	393
18	1.302	522	520
19	1.274	318	316
TOTAL	7.083	2.167	2.145

documented the dental care of the patients answering the questionnaire, the following caries epidemiological data were compiled:

*DMFT* - Decayed, Missing and Filled teeth

*DSp* - Decayed proximal Surfaces; i.e. number of proximal surfaces with caries lesions extending into the dentin

*DFS* - Decayed Filled proximal Surface

*DIp* - Initially Decayed proximal Surfaces; i.e. number of proximal surfaces with caries lesions within the enamel.

The data were statistically analyzed by multiple regression analyses on all variables and by Student's t-test.

## RESULTS

Of the 2167 patients asked to fill in the questionnaire concerning tobacco habits, 2145 (1122 boys and 1023 girls) completed the questionnaire. The age distribution of the different tobacco consumers and the non-tobacco users is shown in Table 2. As can be seen from the table, the number of tobacco users increased with age.

Tobacco was used in some form among 571 adolescents (27%), 29 per cent of the boys and 24 per cent of the girls.

Of the tobacco users, 374 (65%) smoked and 197 (35%) used snuff. 12 per cent of the boys and 24 per cent of the girls smoked while 17 per cent of the boys and only 5 of the girls used snuff. Depending on the consumption of cigarettes per day the smokers were divided in to three groups.

<i>Low consumers</i>	<10 cigarettes/day	38%
<i>Moderate consumers</i>	>10<20 cigarettes/day	46%
<i>High consumers</i>	>20 cigarettes/day	16%

Three per cent of the smokers had smoked less than 2 years, 39 per cent had smoked between 2 and 5 years and 18 per cent had smoked more than 5 years.

The patients were grouped according to the amount of snuff consumed per week as follows:

<i>Low consumption</i>	> 50<100 g	23%
<i>Moderate consumption</i>	>100<200 g	53%
<i>High consumption</i>	>200 g	24%

The duration of snuff use varied between 1 and 5 years. Fifty per cent had used snuff less than 2 years, 30 per cent between 2 and 5 years and 20 per cent for more than 5 years.

The multiple regression analysis showed a positive correlation between DMFT and cigarette smoking ( $p<0.001$ ), DMFT and the number of cigarettes smoked per day ( $p<0.01$ ) and DMFT and the number of years that snuff had been used ( $p<0.05$ ). Further, every extra cigarette smoked per day, added a value of 0.1 to the DMFT value ( $p<0.01$ ).

A positive correlation was also found between the values for DIp and the number of cigarettes smoked per day ( $p<0.05$ ). A correlation was also observed between DSp and the number of years of smoking cigarettes ( $p<0.01$ ) irrespective of increasing DSp with age. For DFS, a positive correlation

Table 2. Distribution of non-users of tobacco, smokers and snuff dippers according to age.

Age	Non-users (%)	Smokers (%)	Snuff dippers (%)	Total (%)
14	122 ( 8)	10 ( 3)	5 ( 4)	137 ( 7)
15	344 (22)	26 ( 7)	24 ( 6)	394 (18)
16	297 (19)	60 (16)	28 ( 7)	385 (17)
17	294 (18)	69 (18)	30 ( 8)	393 (18)
18	325 (21)	121 (32)	74 (14)	520 (24)
19	192 (12)	88 (24)	36 (11)	316 (16)
TOTAL	1.574 (74)	374 (17)	197 ( 9)	2.145

was found with smoking as a habit as such ( $p < 0.01$ ).

For the t-test the material was grouped into three groups: A: *tobacco users/non-tobacco users* (all individuals), B: *smokers/non-smokers*, C: *snuff dippers/non-snuff dippers*. Comparisons were made within each group and for each age group regarding the caries epidemiological data DMFT, DSp, DFSp and DIp (Fig. 1). For DMFT, DFSp and DIp all values were significantly higher ( $p < 0.001$ ) in all groups for tobacco users, smokers and

snuff dippers compared to those not using tobacco in any form. The DSp values were significantly higher ( $p < 0.01$ ) in the overall group of tobacco users and in tobacco smokers. Regarding the different age groups, some significant differences were found, especially among the three older age groups (Table 3). In the 17-year-old group all epidemiological caries indices were significantly higher among the users compared to the non-users ( $p < 0.001$ ).

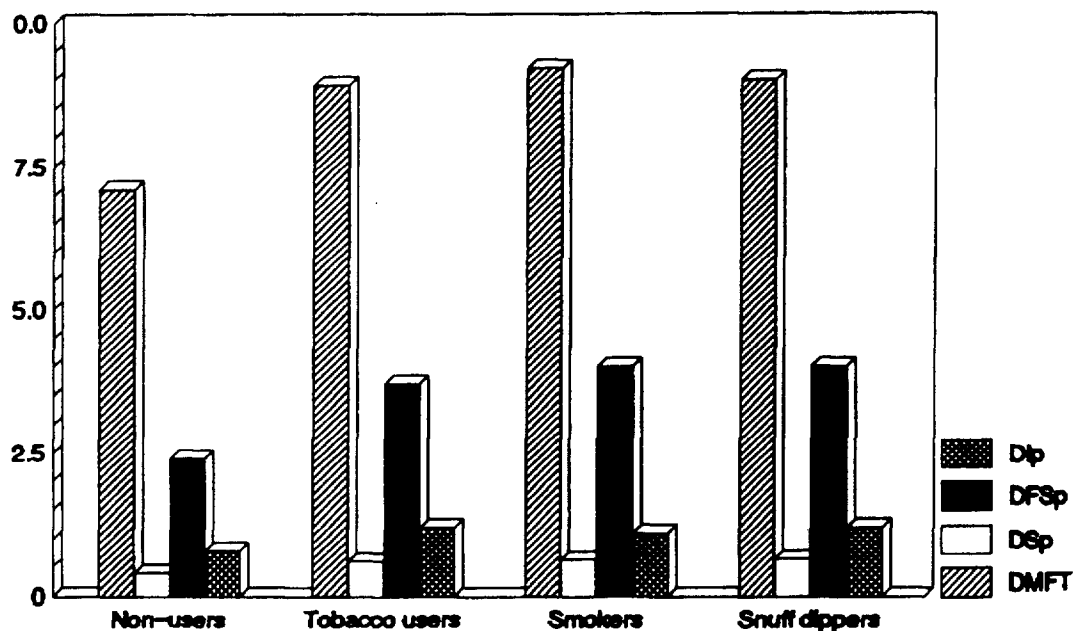


Fig. 1. Caries epidemiological data for non-users, tobacco users, smokers and snuff dippers.

Table 3. Statistical analyses of epidemiological caries index values in each age group. + denotes higher index values and - lower values compared to the non-users, (U = tobacco user; S = tobacco smoker; SD = snuff dipper; \*1 =  $p < 0.05$ ; \*\*2 =  $p < 0.01$ ; \*\*\*3 =  $p < 0.001$ ).

Age	14	15		17			18	19	
HABIT	S	U	S	U	S	SD	U	U	S
DMFT	+ ***	+ *	+ *	+ ***	+ **	+ *	+ *	+ **	+ ***
DSp	- *			+ *			+ *		
DFSp				+ **					+ *
DIp		+ *		+ *			+ *		

## DISCUSSION

The choice of the nine dental clinics were based on the socio-economic structure and the caries situation in the City of Göteborg, and these clinics were regarded as being representative as a mean population in the studied age groups. As the multiple regression analyses did not discriminate age as being a contributing factor the different age-groups were pooled in the further statistical analyses.

Twenty-seven per cent of the patients in this study used some kind of tobacco. These figures correspond with those from other investigations of tobacco habits in the City of Göteborg as well as with those from studies in other parts of Sweden (*Löfgren et al 1987, Pellmer 1989*).

In the study from Göteborg (*Löfgren et al 1987*) the frequencies of smokers among the 15- and 18-year-old teenagers were reported to be 15 per cent and 27 per cent, respectively. In the present report the frequency in the younger age group was lower (8%), while it was almost the same in the older group (26%). Regarding the length of time of tobacco use it was noted that the subject participating in the present study had used tobacco a shorter time than in the earlier report from Göteborg (*Löfgren et al 1987*).

In the present report 11 per cent used snuff. Among the 15- and 18-year-old individuals 7 per cent and 17 per cent, respectively, used snuff. The corresponding figures from the previous report from Göteborg were 8 per cent and 26 per cent, respectively (*Löfgren et al 1987*). In aggregate, the frequency of tobacco users ages 15 and 18 in the present report was lower than earlier reported.

The reason for fewer snuff users found in this study might be related to the selection of the participating clinics. Most of the clinics were situated in the central area of Göteborg with a middle class population. Snuff dipping is more common among groups with lower socioeconomic status, which may account for the discrepancies (for review see *Hirsch 1983*).

This study has also identified tobacco users as a potential caries risk group. The total amount of exposure to tobacco in terms of number of cigarettes consumed and years of snuff use was significant in this respect. It is not known if the vast number of chemical substances in tobacco (*Hoffmann & Adams 1981*) might enhance the caries process or interfere with biological systems in the oral cavity (*Modeér et al 1980*). However, no *in vitro* effects of tobacco chemicals from snuff have been reported on the growth rate of oral bacteria (*Lindemeyer et al 1981*). Tobacco chemicals also exert general effects on the immune system, which might influence the development of infectious diseases (For review see *IARC 1986 pp. 194-8*).

The statistical analysis of the epidemiological caries indices for the whole group showed significantly higher values for tobacco users, smokers and snuffers. However, there are a number of other possible explanations for the differences in the occurrence of caries in tobacco users and non-users, i.e. diet, oral hygiene, fluoride exposure etc. *Modeér et al 1980*, reported that snuff dippers with established gingivitis due to plaque accumulation had more caries lesions than snuff users without gingivitis. It could be expected that tobacco users might have established other dietary habits, including frequent intakes of tablets and chewing gum. It is possible that irregular eating habits and bad oral hygiene might be the dominating factor and not the tobacco use *per se* (*Ainamo 1971*). Previous studies investigating the saliva factors such as secretion rate and buffer effect and the number of lactobacilli, *Streptococcus mutans* and yeast counts among smokers and non smokers did not reveal any influence on the saliva, however, the smokers had higher numbers of bacteria but not yeast (*Heintze 1983, Lavstedt 1978, Ludwick et al 1952, Parvinen 1983*). The bacteriological data found in these studies indicated that smokers not only had bad oral hygiene, but also had different eating habits, presumably consum-

ing higher amounts of sugar containing products.

The fluoride content in snuff varies extensively between different brands. Report from the US have shown that snuff products contain 0-9 ppm (Weintraub & Burt 1986). However, Swedish snuff contains only minute quantities (Norén & Hirsch, Unpublished data).

The clinics chosen in this study represent a middle class population, with a low caries prevalence. Despite a low caries frequency, patients with tobacco habits were still discriminated as at risk for developing caries. In areas with a higher caries prevalence the effects of tobacco on the development of caries could either be overshadowed by the high caries activity *per se* or possibly be even more marked.

It can thus be concluded from this study that tobacco habits increase with age and that there is a positive correlation between increased usage of tobacco and increased caries prevalence. Ainamo (1971) has previously failed to confirm any correlation between tobacco consumption *per se* and dental caries in males aged 18 to 26 years, while Ludwick & Massler (1952) reported that those who smoked more than 15 cigarettes daily had significantly higher number of decayed, missing and filled teeth. However, no statistical analysis was presented.

There are still a number of issues, such as dietary and oral habits, which have to be elucidated before any definite conclusions can be drawn regarding the effect of tobacco habits on the development of caries.

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