

Cigarette smoking, snuff use and alcohol drinking: coexisting risk behaviours for oral health in young males

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Abstract – Objectives: The use of oral moist snuff (*snus*) is widespread among Swedish men, but little is known about the use in adolescents. The aim of this study was to describe patterns of snuff dipping, smoking and alcohol drinking in a sample ($n = 6287$) of 9th grade male students participating in a census survey in the Stockholm region. **Results:** About 20% of the sample reported use of *snus*, and more than two-thirds of *snus* users were also cigarette smokers. Among current nonusers of tobacco (66% of the sample), 14% reported frequent binge drinking, in contrast to 49% among current exclusive cigarette smokers, 60% among exclusive *snus* users and 69% among users of both cigarettes and *snus*. The estimated mean annual consumption of alcohol was 5–10 times higher among tobacco users than among nonusers, with users of *snus* consuming more alcohol than smokers. Compared to non- or minimal drinkers, heavy alcohol drinkers had a disproportionately higher risk to report *snus* use, after adjustment for smoking behaviour (OR = 16.7, 95% CI 12.9–21.7). When the analysis was restricted to users of only one type of tobacco, heavy drinkers were twice as likely to report *snus*, rather than cigarette, use. **Conclusions:** Both tobacco use and alcohol drinking have been independently associated with a variety of pathological oral conditions in adults. These behaviours coexist in early adolescence. Their effect on oral health need to be investigated in prospective studies and should be of concern to the dental professionals.

Key words: adolescents; alcohol drinking; oral snuff; smoking; survey; Sweden

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Apart from being the single most important determinant of cancer and cardiovascular diseases, smoking is also a threat to oral health (1–3). Smoking is causally associated with oral and pharyngeal cancer, and the use of alcohol increases the risk even further (4, 5). Smokers are also at higher risk of developing periodontal disease and severe disease progression (6–8). The health consequences of smokeless tobacco, on the other hand, are not well known, mostly because of the limited amount of research in this field and lack of knowledge on the population patterns of use. Knowledge is particularly scanty on the use among youths, although substance use is often established by the end of adolescence. In this study, we describe the patterns of exposure to three major hazards for the oral mucosa, i.e. cigarette

smoking, *snus* use and alcohol drinking among Swedish male adolescents.

Subjects and methods

The study design and material have been described previously and will only be reported in brief (9). This was a census survey on drug use and other health behaviours conducted in 1998 among students attending 9th grade in the Stockholm region, i.e. adolescents 15–16 years of age. The response rate was 83%. As the use of smokeless tobacco is very rare among girls in Sweden, the study population is entirely made up of boys. Of the 6465 male subjects participating in the survey, 6287 answered all the

questions on tobacco use and were therefore included in the analysis.

The study instrument consisted of an anonymous questionnaire, self-administered in the classroom. Tobacco use was assessed through the following two questions: "Do you currently smoke/use *snus*?" The following response alternatives were given: No, I never did; no, I only tried; no, I quit; yes, daily; yes, almost daily; yes, but only on weekends/at parties/at times. Daily smokers were further asked about their daily cigarette consumption, while all users of *snus* were asked about their weekly consumption according to five predefined categories.

The following information on alcohol drinking was analysed: any use of alcoholic beverages (more than 2% ethanol in volume) in the 10 weeks preceding the survey; any use of alcoholic beverages in the 7 days preceding the survey; frequency of very high consumption of alcoholic beverages on a single occasion (binge drinking); frequency of drinking each of five types of alcoholic beverages together with the respective average quantity drunk on each occasion. Binge drinking was defined as drinking at least 35 cl of hard liquor (40% ethanol in volume), one bottle (75 cl) of wine, 180 cl of strong beer (5% ethanol in volume) or 270 cl of medium beer (3.5% ethanol in volume) on one single occasion.

Statistical methods

Current use of tobacco (all from 'at times' to 'daily') was categorised as follows: no use; cigarette smoking only; use of *snus* only; combined cigarette smoking and use of *snus*.

Based on the alleged drinking patterns (type, frequency and amount of alcoholic drinks) and on the average ethanol content in each beverage, an index of individual annual alcohol consumption was devised (10). The following characteristics of social background were included in the analysis: living with both parents (yes/no); parental education (≤ 9 years; 10–12 years; >12 years; other unspecified); parental birthplace (within or outside Sweden).

In a bivariate analysis, we compared either the proportions of tobacco users across categories of the covariate of interest or the covariate mean in subgroups of tobacco use. The Pearson's chi-square statistic was used to test the null hypothesis of no departure from the expected distribution in case of comparison between proportions. The one-way analysis of variance was used to compare the mean alcohol consumption of several subgroups of tobacco users.

In a multivariate analysis, we calculated the cross-sectional odds ratios of tobacco use associated with each factor under study while simultaneously controlling for other factors.

We conducted two separate analyses. In the first place, we used information from all study subjects and modelled the likelihood of being a *snus* user, conditionally on smoking behavior. The second analysis was restricted to the users of a single type of tobacco product, therefore modelling the likelihood of being a *snus* user rather than a cigarette smoker. Logistic regression models based on maximum likelihood methods were used to obtain the estimates of model parameters and their corresponding standard errors (11). These were used to calculate the measures of association (odds ratios, ORs) and their corresponding 95% confidence intervals (95% CIs). The Wald statistic was used to test the departure of the model parameters from the expected value of 0, with level for the statistical significance set at 5% ($P < 0.05$), while the $-2\log$ likelihood statistic was used to compare the fit of different models.

All associations between alcohol and tobacco use were analysed, both in bivariate models and after adjustment for characteristics of the social background. If this adjustment did not yield modifications of the estimates or did not significantly improve the fit of the model, the unadjusted results were reported.

Results

Current tobacco use in the study sample is presented in Table 1. Thirty-four per cent of the boys reported current use of tobacco in some form, and nearly 20% used *snus*. Among *snus* users, more than two-thirds were also cigarette smokers.

Altogether, 66% of the study population reported consumption of alcoholic beverages on at least one occasion during the 10 weeks prior to the survey,

Table 1. Current tobacco use among boys in the 9th grade, Stockholm County, 1998

Type of tobacco	Current use	
	N	%
No use	4161	66.2
Only cigarette smoking	898	14.3
Only <i>snus</i> use	359	5.7
Combined use of both cigarette and <i>snus</i>	869	13.8
Total	6287	100

Table 2. Consumption of any alcoholic beverage in the 7 days prior to the survey, by category of tobacco use

Current tobacco use	Consumption of alcoholic beverages	
	Any, N (%)	Total, N (%)
No use	1016 (24.4)	4161 (100)
Only cigarette smoking	514 (57.2)	898 (100)
Only <i>snus</i> use	231 (64.4)	359 (100)
Combined use of both cigarettes and <i>snus</i>	630 (72.5)	869 (100)
Total	2391 (38.0)	6287 (100)

$\chi^2_{3 \text{ d.f.}} = 1011.294; P < 0.01.$

and 48% reported drinking on more than one occasion (data not shown). These proportions were lowest among nonusers of tobacco (52 and 32%, respectively), and highest among current smokers who also used *snus* (97 and 87%, respectively). Among students who reported either only cigarette smoking or only use of *snus* proportions fell between these extremes (about 90% reported consumption of alcohol of either kind), with a slightly higher proportion of frequent drinkers among exclusive users of *snus*. Recent alcohol drinking (past 7 days), according to current tobacco use, is presented in Table 2. Again, the proportion of drinking alcohol was lowest among nonusers of tobacco and highest among 'mixed users' of *snus* and cigarettes. Exclusive users of *snus* reported recent drinking more often than exclusive cigarette smokers.

The frequency of binge drinking, according to current tobacco use, is reported in Fig. 1. The proportion of boys reporting occasional high alcohol consumption at least once a month increased markedly from 'nonusers' of tobacco to 'mixed users', with the next highest figure (60%) among exclusive users of *snus*. ($P < 0.01$).

Table 3 reports the estimate average of annual alcohol consumption (litres of ethanol/year) in relation to current use of tobacco in the study population. The mean consumption differed significantly between categories of current tobacco use ($P < 0.01$), again with increasing gradient from nonusers to

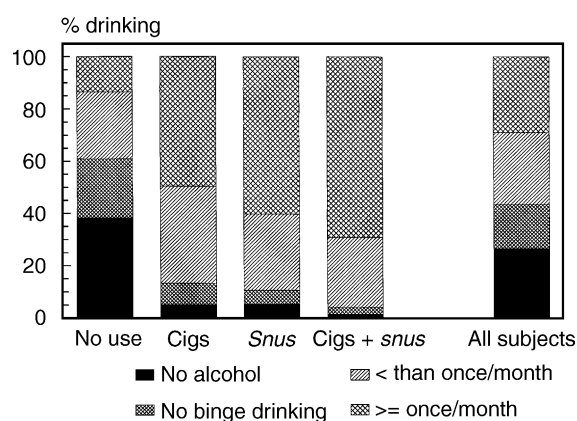


Fig. 1. Binge drinking according to current tobacco use among boys in the 9th grade, Stockholm County, 1998.

'mixed' users, while exclusive *snus* users had a slightly higher mean consumption than exclusive cigarette smokers.

In addition, a high alcohol consumption corresponded to a high consumption of tobacco of either type (data not shown). Boys who smoked or used *snus* daily or almost daily had an estimated annual ethanol intake five times greater than boys who neither smoked nor used *snus*. The corresponding ratios among occasional smokers and occasional users of *snus* were twice and 1.3 times greater, respectively.

Figure 2 shows the odds ratios (ORs) of current *snus* use for three categories of increasing annual

Table 3. Estimated annual consumption of alcohol (litres of ethanol/year) according to categories of current tobacco use among boys in the 9th grade, Stockholm County, 1998

Current tobacco use	Estimated litres of ethanol/year			
	Mean	SD	Median	Range
No use	1.6	4.6	0.1	0–68.3
Only cigarette smoking	6.6	9.8	3.4	0–87.7
Only <i>snus</i> use	7.6	9.6	4.5	0–75.8
Combined use of both cigarette and <i>snus</i>	11.9	13.2	7.7	0–98.2
Total	4.1	8.4	0.6	0–98.2

ANOVA F for the comparison between means = 493.02; $P < 0.01$.

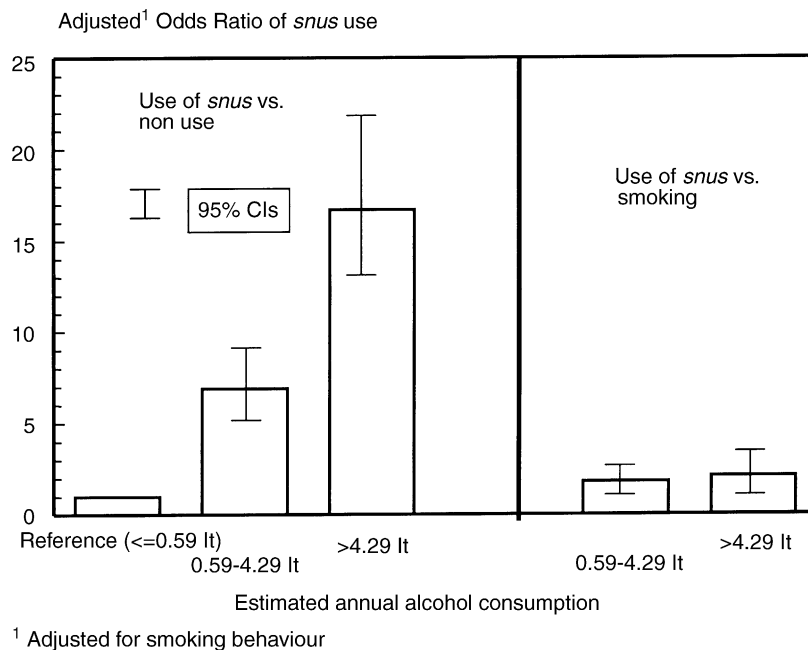


Fig. 2. Odds ratios and 95% confidence intervals (CIs) of *snus* use according to annual alcohol consumption among boys in the 9th grade, Stockholm County, 1998.

alcohol consumption. After taking smoking behaviour into account, there was a 17-fold increase in the probability of being a *snus* user associated to the two highest categories of alcohol consumption compared to the lowest (Fig. 2, left side). In addition, there was a 7% monotonic increase in the odds with each additional litre of ethanol per year (data not shown). When the analysis was restricted to users of only one type of tobacco, there was still a twofold increase in the probability of being a *snus* user for subjects in the two highest categories of alcohol consumption, compared to the lowest (Fig. 2, right side). However, no association was seen between alcohol consumption as a continuous variable and smoking. All associations mentioned above were only slightly altered after adjustment for parental education or for parental birthplace, and not at all modified after adjustment for living with both parents.

Discussion

Smoking is the predominant form of tobacco use in most countries. In the western world, adolescent rates of cigarette smoking are similar between genders. However, the use of smokeless tobacco is an almost exclusive male behaviour, in Sweden as elsewhere (12–14). Among males, both the adult prevalence of daily use and the youth overall prevalence of current use of *snus* (the Swedish variety of oral moist snuff) are around 19%, the highest prevalence of smokeless tobacco use in the western world. In line with other studies, we found a strong

covariation of *snus* use with both cigarette smoking and alcohol drinking (15–17). Previous studies, however, did not always distinguish between exclusive use and combined use of smokeless tobacco and cigarettes, and did not present quantitative information on tobacco use and alcohol consumption. The association with alcohol drinking was strongest among *snus* users, even when compared to smokers. This latter finding was consistent and has not been described before. For instance, the proportion of binge drinkers among exclusive *snus* users was 30% higher than among smokers not using *snus*, as was the average annual consumption of alcohol. Heavy drinkers had a twofold increased probability of being exclusive *snus* users rather than exclusive cigarette smokers, compared to non- or minimal drinkers. On the other hand, the highest alcohol consumption and frequency of binge drinking occurred among current users of *snus* who also smoked cigarettes, representing the large majority of *snus* users in this young population. Whether this latter profile indicates social circumstances (e.g. different social norms on alcohol drinking, availability of alcoholic beverages) or the emergence of peculiar clusters of substance abuse is a question that cannot be addressed in this study. Previous analyses conducted within the frame of the same survey indicated that multiple risk behaviours are common among boys using both types of tobacco (9).

Smoking and alcohol drinking have been independently associated with several pathological oral conditions, the majority of which have a long induction period, while others should be considered even

in clinical settings with adolescents. The association of both smoking and alcohol drinking with oropharyngeal cancer is well supported. The risk increases with low age at the onset of the habit. Alcohol drinking and smoking show a multiplicative interaction (4, 5). Smoking is also associated with non-neoplastic oral pathological conditions. Smokers have a fivefold increased risk of severe periodontitis, and 80% of all patients with refractory periodontitis are smokers (6, 18–20). Early onset periodontitis is more prevalent among smokers than among nonsmokers (21, 22). Impaired wound healing and failures of treatment with dental implants is more common among smokers than among nonsmokers. Dental implants is an option when treating traumatically leads to loss of teeth in young patients (23–27).

On the other hand, the evidence of an increased risk of oral diseases associated with *snus* use is controversial. Studies conducted in the US have described an association between snuff use and oral cancer, but Swedish studies do not confirm these findings (28–30).

Gingival recession, local attachment loss and snuff dipper's lesion have been described among regular *snus* users, but other consequences of *snus* use on human oral health are not well established (31, 32). To our knowledge, the long-term consequences for the oral mucosa of the combined use of *snus*, smoking and alcohol have not been reported, but there are reasons to assume interactive effects. Our study shows that once these products are extensively marketed, as it is the case in Sweden, their joint use is frequent at very young ages. The prevalence of regular smoking and use of *snus* in national surveys of 15-year-olds has been practically constant in the last 15 years. On the other hand, there is evidence from the same surveys that alcohol consumption is steadily increasing since the early 90s (12). Should these trends continue, we can foresee that an increasing proportion of the young male population will be exposed to the combined force of these lifestyle risk factors. In addition, we have to bear in mind that tobacco and alcohol are addictive, and therefore their use is likely to be long-lasting and difficult to abandon (33, 34). Longitudinal studies are warranted in order to detect and quantify both short- and long-term consequences for oral health of these combined exposures.

This census survey among 9th grade students had a high response rate and a detailed compilation of lifetime history of tobacco as well as of alcohol use. Both behaviours were self-reported; therefore, some

degree of deliberate misclassification may be expected. Studies on adolescent smoking, however, show that this misclassification is generally unimportant, especially in anonymous surveys, and is not a threat to the validity of the results (35). Biased results as a consequence of differential reports of each behaviour across levels of the other behaviours (e.g. heavy drinkers artificially reporting more tobacco use than abstainers) cannot be excluded, but seem unlikely.

If cigarette smoking, use of *snus* and alcohol drinking coexist in a significant proportion of male adolescents, this will have major implications for the dental professionals, knowing that each of these behaviours is likely to affect oral health later in life, and that their effect may be synergistic. Dental professionals, indeed, find themselves in a privileged position for the promotion of oral health, as 50–85% of the population visit their dentist every year (36, 37). First of all, we suggest that the collection of anamnestic information from adolescents in the clinical practice should encompass a detailed history of lifetime exposure to oral hazards, in particular alcohol drinking and use of all types of tobacco. Secondly, concomitant high alcohol consumption and cigarette smoking should be suspected in adolescent users of *snus*. Therefore, dental staff treating children and adolescents should be committed to early detection of these behaviours, as well as delivery of individual advice in order to avoid, among several health problems, poor oral health.

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