Between harm and dangers

Oral snuff use, cigarette smoking and problem behaviours in a survey of Swedish male adolescents

M. ROSARIA GALANTI, SEPPO WICKHOLM, HANS GILLJAM *

Background: The prevalence of smokeless tobacco use (moist snuff) in Sweden is among the highest world-wide, and snuff is gaining popularity as a less harmful alternative to cigarettes. Methods: Patterns of current tobacco use and indicators of behavioural problems were analysed in a sample of 6287 boys participating in a census survey among 9th graders in Stockholm County, Sweden. Results: Among participants reporting current use of oral snuff (OS) the majority (71%) also smoked cigarettes. The prevalence of daily smoking was significantly higher in this group than among exclusive smokers. Conditionally on smoking behaviour, the likelihood of being a current user of OS was several times higher among boys who had ever been drunk (adjusted odds ratio =9.64, 95% confidence interval: 7.32–12.94) or experimented with illicit drugs (adjusted odds ratio =2.39, 95% confidence interval: 1.99–2.87), compared with those who did not. OS use was also significantly associated to other problem behaviours such as drinking and driving, unsafe sex, and school truancy. The same pattern of associations was present when the analyses were restricted to tobacco users. Conclusions: Smokeless tobacco use in adolescence does not substitute cigarette smoking and can be an indicator of a drug- and risk-seeking lifestyle. The availability of smokeless tobacco might thus increase the potential for nicotine addiction in some vulnerable subgroups of young males.

Keywords: adolescents, conduct disorder, risk reduction, smokeless tobacco, Sweden

The use of smokeless tobacco (SLT) shows wide variations world-wide, but products and patterns of use are not directly comparable.[1] In European countries the sales of SLT are forbidden. An exception was granted to Sweden, where oral tobacco, in the form of oral moist snuff (OS) is used daily by 19% of men between 16 and 84 years of age.[2] In contrast, just about 1% of Swedish women make regular use of OS. In spite of this established behaviour, little is known about OS use and its relation with cigarette smoking in the Swedish male population, particularly at the age of the transition from experimental to regular use.

In the present study, we report on patterns and behavioural correlates of oral snuff use and cigarette smoking in a sample of 9th grade students in Stockholm County, Sweden.

METHODS

Study population and design

A national survey on tobacco, alcohol, and drug use has been conducted in Sweden each year since 1971 among students in the 9th grade, at the end of compulsory education. At this time, students are between 15 and 16 years of age. Since 1986 the Swedish Council for Information on Alcohol and Other Drugs (CAN) is the national agency responsible for this annual survey.

In the spring of 1998 the national survey was complemented with a census survey in the County of Stockholm, i.e. targeting all 9th grade classes in the area. The response rate was 83%, yielding 12,860 participants (6,465 boys and 6,395 girls). Among girls, only 1.3% reported current use of oral snuff, and we therefore restricted the analysis to boys, 6,287 of whom provided valid answers on their tobacco use (including non-use).

The study instrument consisted of an anonymous questionnaire, self-administered in the classroom, encompassing a total of about 80 questions, a dozen of which concerned tobacco-related issues. The remaining questions investigated the use of alcohol and illicit drugs, access to drugs, social influences and sources of information on the consequences of abuse. Information on the students' social background (whether living with both parents, parental country of origin and parental education), school environment and relation to school, relations with peers, behavioural problems and psychological well-being was also collected through the same instrument.

Tobacco use was assessed by the two separate questions: 'Do you currently smoke/use oral snuff?' The following response alternatives were given for smoking: 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. The response alternatives for OS use were identical to those for smoking but for occasional use, which was represented by only one alternative ('at times').

* M.R. Galanti[1], S. Wickholm[1], H. Gilljam[1]
† Stockholm Centre of Public Health, Centre for Tobacco Prevention, Stockholm County Council, Sweden
Correspondence: M. Rosaria Galanti, Stockholm Centre of Public Health, Centre for Tobacco Prevention, Box 17533, S-118 91 Stockholm, Sweden, tel. +46 8 51778055, fax +46 8 51778072

Only daily smokers were further asked about their average cigarette consumption, while all users of oral snuff were asked about their weekly consumption according to five pre-defined categories. The core questions on tobacco in the regional survey were the same as in the national survey, as last modified in 1997. This modification was introduced in order to achieve the highest possible sensitivity of the instrument among occasional users. The smoking prevalence estimated through the modified questions exceeded that estimated by the traditional form by 65% among boys and 48% among girls in a national sample.[3]

The use of tobacco self-reported with this form was never validated with biochemical methods.

Statistical methods

Oral snuff (OS) use and cigarette smoking were categorized both as use ever in life (i.e. lifetime use) and as current use (i.e. use at present), the latter including any frequency of use, from 'only at times' to 'daily'. A further distinction was introduced between 'exclusive use' (i.e. use of only one type of tobacco) and 'mixed use' of cigarettes and OS. This allowed a classification of tobacco use into four mutually exclusive categories: non-use, smoking only, OS only, both cigarettes and OS. Based on their alleged daily consumption of cigarettes students who smoked daily or almost daily were classified as moderate (less than ten cigarettes/day) and heavy (ten cigarettes/day or more) daily smokers. All subjects reporting smoking 'almost daily' were included in the former group.

Predictors and correlates were analysed for current tobacco use only, as follows. Living with both parents; parental education (≤9 years; 10–12 years; >12 years; other unspecified); parental birthplace (whether both parents were born in Sweden); experience of alcohol abuse and alcohol related behavioural problems; lifetime use of illegal drugs; school truancy (never; up to once a month; more than once a month) and other problem behaviours at school. Predictors and correlates of tobacco use were analysed in a univariate analysis by comparing the proportions of users across levels of the predictor variable. Pearson's chi-square statistic was used to test the null hypothesis of no departure from the expected distribution.

In a multivariate analysis we calculated the cross-sectional odds ratios of OS use associated with each factor under study while simultaneously adjusting 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 only the unadjusted results are reported.

For the purpose of this analysis all variables but parental education were dichotomized (yes/no). We conducted separate analyses either by using information from all subjects (after further control for smoking status), or by restricting the analysis to tobacco users, to smokers, or to exclusive users of only one type of tobacco. Logistic regression models based on maximum likelihood methods were used to obtain the model parameters and their corresponding standard errors.[4] These were used to calculate the measure of association (odds ratio, OR) and the corresponding 95% confidence intervals (95% CI). The Wald statistic was used to test the departure of the model parameters from the expected value of zero, while the −2 log likelihood statistic was used to compare the fit of different models.

For the purpose of inference, the level for the statistical significance was set at 5% ($p<0.05$).

RESULTS

The prevalence of ever (lifetime) use and of current use of tobacco in the study population are reported in *table 1*: 72% of the boys had used tobacco, but only one-third were current users. Slightly above 19% of the students currently used oral snuff (OS); the majority of these (71%) did so in combination with cigarette smoking. In *table 2* the frequency of smoking (daily or almost daily versus less than daily) is compared for exclusive smokers and for users of both types of tobacco. The proportion of daily smokers was significantly higher among 'mixed users' than among 'pure smokers' ($p<0.01$). There was also a higher proportion of heavy smokers (ten or more cigarettes a day) in the former compared to the latter group, but this difference did not attain statistical significance (data not shown).

Current cigarette smoking only, but not exclusive OS use, was more common among boys living in single-parent or reconstituted families *(table 3)*. Students reported tobacco use, especially OS, more often in case both parents were born in Sweden. A lower proportion of OS users and of 'mixed users' of tobacco, but a higher proportion of exclusive smokers was seen in the highest

Table 1 Reports of tobacco use among boys in the 9th grade, Stockholm County, 1998

	Ever		Current	
	N	%	N	%
No tobacco use	1,752	27.9	4,161	66.2
Only cigarettes	1,468	23.3	898	14.3
Only oral snuff	199	3.2	359	5.7
Both cigarettes and snuff	2,868	45.6	869	13.8
Total	6,287	100	6,287	100

Table 2 Frequency of smoking among boys smoking cigarettes in the 9th grade according to their use of oral snuff, Stockholm County 1998

	Frequency of cigarette smoking			
	Not daily		Daily or almost daily	
Use of oral snuff	N	%	N	%
No ('exclusive' smokers)	594	66.2	304	33.8
Yes ('mixed users')	412	47.4	457	52.6

$\chi^2_{1,df} = 63.23$; $p<0.01$

compared to the lowest category of parental education. It should be noted, however, that about 25% of the students were not able to report on their parents' education. In this group the prevalence of cigarette smoking was slightly higher than among boys providing information on parental education *(table 3)*.

Subjects reporting the problem behaviours considered in this analysis were more prone to report use of both types of tobacco *(table 4)*. With no exception, the ratio of prevalence of tobacco use between those presenting and those not presenting a particular behaviour was highest for the combined use of OS and cigarettes. In a logistic regression analysis conditionally on smoking behaviour *(table 5)*, having at least one parent born outside Sweden and high parental education were significantly associated with decreased likelihood of OS use. All problem behaviours under study were strongly positively associated with the likelihood to be a current OS user. Above all, experience of alcohol abuse was associated with a nearly ten-fold increased probability of being an OS user, while having ever tried illicit drugs was associated with a more than doubled risk of OS use. These estimates were not substantially altered after adjustment for characteristics of the social background. Adding a term for parental birthplace, however, significantly improved the fit of the regression models. The same patterns of associations, albeit slightly weaker, were observed when the analysis was restricted to smokers, i.e. students who reported combined use of OS and cigarettes were contrasted to students who reported cigarette smoking only (data not shown). When the analysis was restricted to users of only one type of tobacco, exclusive OS users were contrasted to exclusive cigarette smokers. There was still a significant negative association with parental birthplace (at least one parent born outside Sweden compared to both parents born in Sweden) and with the highest level of parental education compared to the lowest (data not shown). Experience of alcohol abuse and of driving while drunk were not significantly associated with being an OS user, whereas school truancy (OR=0.73, 95% CI: 0.55–0.96) and any use of illicit drugs (OR=0.64, 95% CI: 0.46–0.87, adjusted for parental birthplace) were associated with a decreased probability of being an exclusive OS user versus an exclusive smoker.

DISCUSSION

The use of Swedish oral tobacco (moist snuff) has not been consistently associated with relevant health hazards,[5] and is therefore regarded as relatively safe compared to cigarette smoking. As a consequence of aggressive product marketing and perhaps of this absence of health concern the consumption of oral snuff has been continuously increasing since the late 1960's, especially at young ages.[6] According to data from the national

Table 3 Social characteristics and current tobacco use among boys in the 9th grade, Stockholm County, 1998. Percentages of tobacco use in each category of the social characteristic

	No current tobacco use %	Only cigarette smoking %	Only snuff use %	Both cigarettes and snuff %	Total number of answers
Living with both parents					
Yes	68.3	13.4	5.5	12.7	4,279
No	61.9	16.0	6.0	16.1	1,955
χ^2 3 df =25.94, p<0.01					
Both parents born in Sweden					
Yes	63.8	14.0	6.7	15.5	4,262
No	71.3	14.8	3.6	10.3	2,025
χ^2 3 df =62.87, p<0.01					
Mother's education (years)					
≤9	66.8	11.9	6.0	15.3	680
10–12	66.4	13.2	7.1	13.2	1,601
>12	65.9	16.2	4.5	13.4	2,153
Other	70.0	12.5	5.1	12.5	313
χ^2 9 df =24.00, p<0.01					
Don't know	65.5	14.1	6.0	14.4	1,434
Father's education (years)					
≤9	62.9	12.9	7.7	16.4	712
10–12	65.9	12.9	6.6	14.6	1,401
>12	67.3	16.0	4.5	12.2	2,344
Other	71.1	12.3	6.3	10.3	301
χ^2 9 df =34.96, p<0.01					
Don't know	65.6	14.0	5.8	14.6	1,421

Bureau of Statistics,[2] the proportion of daily users among men in 1997 compared to 1989 had increased by 17% in all age groups, but by 20% at ages between 25 and 34 years and by 32% at ages between 35 and 44 years. In contrast, smoking prevalence among adults, especially men, has continuously declined and is now the lowest in Europe.[7]

No trends of smokeless tobacco use have emerged, however, among the very young, i.e. the population between 15 and 16 years of age surveyed yearly since 1971.[3] In this age group virtually all snuff-dippers are males. Our descriptive study points towards three important features of oral snuff (OS) use in such a young population.

First, OS use among boys is frequent, concerning almost one in five students by the time of the 9th grade.

Second, the large majority of users are also cigarette smokers, who in addition tend to smoke more than smokers who make no use of OS. Being an 'exclusive OS user' at this age seems a feature of experimentation rather than a stable profile, as indicated in this study by the lower lifetime prevalence compared to the prevalence of current use. Oral snuff in Sweden is roughly three times cheaper than cigarettes, its use is of less health concern and is easier concealed, all aspects which are of obvious interest for young experimenters.[8]

Third, in this study OS use was linked with problem behaviours that are, in their turn, important predictors of ill-health or premature death. This link cannot be regarded as causal. It rather points towards a 'clustering' of risk behaviours, at least partly explained by characteristics

Table 4 Problem behaviours and current tobacco use among boys in the 9th grade, Stockholm County, 1998. Percentages of tobacco use in each category of problem behaviour

Problem behaviour	No current tobacco use %	Only cigarette smoking %	Only snuff use %	Both cigarettes and snuff %	Total number of answers
Ever been drunk					
Yes	47.3	21.2	8.9	22.6	3,626
No	93.4	4.4	1.2	1.0	2,569
χ^2 3 df =1451.76, p<0.01					
Fight after drinking[a]					
Yes	29.7	23.6	9.7	36.9	1,083
No	73.4	13.0	4.7	9.0	4,516
χ^2 3 df =836.69, p					
Drinking and driving[a]					
Yes	27.0	21.8	10.7	40.5	775
No	70.9	13.9	5.0	10.2	4,801
χ^2 3 df =687.61, p<0.01					
Unsafe sex after drinking[a]					
Yes	24.7	25.6	10.5	39.3	583
No	69.5	13.8	5.2	11.5	4,984
χ^2 3 df =513.39, p<0.01					
Tried illicit drugs					
Yes	20.5	30.4	8.1	41.1	777
No	73.1	11.8	5.3	9.8	5,418
χ^2 3 df =943.91, p<0.01					
School truancy					
Never	82.2	7.9	4.0	5.9	2,664
≤once/month	61.0	16.9	6.5	15.5	2,613
>once/month	36.5	24.6	8.1	30.8	976
χ^2 6 df =763.97, p<0.01					
Hit/injured someone in the current school year					
Yes	36.1	21.7	8.7	33.5	621
No	70.3	13.1	5.3	11.3	5,484
χ^2 3 df =340.40, p<0.01					

a: High proportion of missing answers among non drinkers

of the social background. Historically, snuff dipping was rare in Sweden outside poorly educated groups in rural areas.[6] These aspects were partly confirmed in our large sample. High parental education was inversely associated with OS use. Boys with at least one non-Swedish parent were less likely to use OS compared to sons of two Swedish parents. An opposite link was found between socio-economic status and use of smokeless tobacco among young people in an American study.[9] This indicates that this relation is probably more complex than for cigarette smoking, and cultural aspects and local traditions play a greater role.

Our analysis identified two distinct profiles of OS use and correlated behaviours. A minority of these 16-year-old boys used OS as an exclusive tobacco product. They typically belonged to Swedish families with a low–intermediate level of parental education. The behavioural problems in this group concerned mainly alcohol abuse and were apparent only when compared to non-users of tobacco. In fact, some indicators of rebelliousness or propensity to drug use and illegal actions were less prevalent among 'pure snuffers' than they were among 'pure smokers'. As noted before, these subjects are likely to represent a sub-group in the initial stage of tobacco experience.

At the other extreme were the large majority of OS users who also smoked cigarettes. They scored high in risk behaviours compared not only to non-users of tobacco, but also to 'pure smokers'. Their risk profile results both from propensity to substance abuse and from general defiance of conduct norms, exemplified by drinking and driving, unsafe sex in connection with alcohol drinking, school truancy and aggressions. Other studies also found a link between combined tobacco use and risk-taking behaviour.[10–13] The findings of these studies, however, are not directly comparable with ours, due to differences in the age groups involved and in the background prevalence of tobacco use. In addition, behavioural differences between 'exclusive' users of either type of tobacco and 'mixed' users are not always displayed.

There are at least two other reasons why this accumulation of problem behaviours should be *per se* of concern for public health. The first reason is the increasing segregation of tobacco use among the most socially disadvantaged groups of the population.[14] The social background and the behavioural profile of these young 'mixed tobacco users' seem to support this concern. We may therefore speculate that the availability of smokeless tobacco increases the potential for heavy and prolonged nicotine addiction in particularly vulnerable groups of the population. Secondly, most behaviour analysed in this study is either directly violent or indicative of an environment where at least micro-criminality is common. Violence is a non-negligible cause of injury and death, especially among young males.[15] Selection of the study population and misclassification of characteristics under study represent the major threats to the validity of results in this type of study. It is acknowledged that the participation rate among smokers is lower than among non-smokers.[16,17] However, the overall response rate in this survey was satisfactory. Moreover, spurious positive associations would also require the prevalence of problem behaviours among non-respondents to be lower than among respondents, which seems unlikely. Misclassification of tobacco use cannot be excluded, as its assessment was based on self-report. Again, if we assume this misclassification to be non-differential across the strata of predictors or correlates its most probable effect would be to bias the estimates of association towards the expected value of one. Furthermore, self-reports of smoking behaviour among young people generally show good reliability.[18,19] In a recent study on the reliability of self-reported drug use among students in the region 98% of the participants stated that they provided trustworthy information (B. Hibell, personal communication).

This large census survey indicates that snuff dipping in urban young male populations of Sweden is far from being an isolated innocent lifestyle. Indeed, our results do not support the hypothesis that the availability of smokeless tobacco contributes to the stability or even to the reduction of cigarette consumption at the population

Table 5 Prevalence odds ratios (OR) of oral snuff use and 95% confidence intervals (95% CI) according to selected social and behavioural characteristics among boys in the 9th grade, Stockholm County, 1998

Predictor or correlate	OR[a]	95% CI
Both parents born in Sweden		
Yes	Reference	–
No	0.57	0.48–0.66
Father's education (years)		
≤9	Reference	–
10–12	0.85	0.67–1.09
>12	0.58	0.46–0.73
Other	0.69	0.46–1.02
Mother's education (years)		
≤9	Reference	–
10–12	0.95	0.74–1.22
>12	0.70	0.55–0.90
Other	0.80	0.54–1.17
Ever been drunk[b]		
No	Reference	–
Yes	9.64	7.32–12.94
Drinking and driving[b]		
No	Reference	–
Yes	3.30	2.52–4.07
Unsafe sex after drinking[b]		
No	Reference	–
Yes	2.71	2.21–3.32
Tried illicit drugs[b]		
No	Reference	–
Yes	2.39	1.99–2.87
School truancy[b]		
No	Reference	–
Yes	1.93	1.65–2.30

a: Among all subjects, conditionally on smoking behaviour.
b: Further adjusted for parental birthplace (in- or outside Sweden).

level.[20] Whether smoking cessation among adults may be encouraged and facilitated by making oral snuff available remains to be seen,[21] but any optimism concerning young people is premature. In the stage of uptake, on the contrary, oral snuff may well represent a 'gateway' towards cigarette smoking,[6] or at least a complementary addictive behaviour.[10] The side-effects on youth smoking of policies of 'harm-reduction' based on nicotine delivering products therefore remain a serious concern.[22]

An established market for smokeless tobacco multiplies the challenges in the field of tobacco control. As an example, school-curricula aiming to prevent substance abuse would need to recognize and incorporate the relationship between age, gender, diverse lifestyles, and use of particular products. Also, effects on health and treatment possibilities of heavy nicotine addiction at very young ages should be on the agenda of future prospective and clinical studies.

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