

Dual use of cigarettes and Swedish snuff (snus) among young adults in Northern Finland

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Background: The sale of smokeless tobacco has been totally banned in Finland since the country joined the European Union in 1995. Adolescents have continued to use smokeless tobacco even after the sales ban. The objective was to describe dual use of Swedish snuff (snus) and cigarettes in young adults living in Northern Finland. **Methods:** This study on male military recruits ($n=1151$, mean age 19.4 years; response rate 80%) investigated association of snus use with self-reported tobacco use, nicotine dependence and attempts to quit smoking. **Results:** Overall, 15.6% ($n=179$) reported daily snus use, and almost half of them were dual users who used both products, i.e. cigarettes and snus, daily. Daily smokers were often occasional snus users (66.3%), and those with dual use smoked equal number of cigarettes per day as daily smokers who were not snus users. In addition, dual snus use seemed to increase the dependence to cigarettes, although this trend did not reach statistical significance. Dual users tried to quit less likely than exclusive smokers. Very few snus users were 'switchers' (ex-smokers) [3.2% ($n=22$) of all snus users]. **Conclusions:** Dual use of snus and cigarettes is common among young in Finland, despite the sales ban on snus. The role of snus in reducing cigarette smoking is unclear, but it is likely that snus use complicates the attempts to quit smoking.

Introduction

There is a vigorous worldwide debate about the use of smokeless tobacco (SLT) in helping individuals to quit smoking and to reduce the harm related to smoking. However, several studies and reviews have been published on the harmful effects of modern SLT products, their associations with malignant and cardiovascular diseases, nicotine dependence and whether they are a gateway to cigarette smoking.^{1–12} SLT is mainly used in India, USA and Sweden. The studies on SLT are not always comparable because the type and composition of SLT varies widely between and even within individual countries.¹ In Sweden and Finland, the main form of SLT is Swedish moist snuff (snus). A recent review² has concluded that SLT products are a major source of carcinogenic nitrosamines, and experiments in rats support the findings from epidemiological studies that have observed increased carcinogenesis related to SLT use. In USA and in Sweden, SLT is also associated with an elevated risk of fatal myocardial infarction and stroke.³ Nonetheless, the health risks related to SLT use seem to be lower than those of smoking,⁴ but only if it is not associated with the widespread dual use of SLT and cigarettes.

SLT has been a focus of interest as a tool to help in smoking cessation and a harm reduction tool, especially in Sweden where adult male smoking and smoking-related diseases have decreased, and this has been suggested to be, at least, partly attributed to 'switching' from cigarettes to snus.¹ However, one concerning trend especially among the young is the use of both cigarettes and snus (dual use) not only in Sweden but also in USA and Norway.^{13–15} In addition, many young males are 'primary snus users', i.e. they have no previous smoking history.^{14,16} It is unknown whether snus has a role as a 'gateway' to the use of more unhealthy nicotine containing products such as cigarettes.^{5–11}

Blood nicotine levels in snus users are similar to those found in smokers, and snus use can result in nicotine dependence comparable with that of smoking.¹ However, very few studies have examined the dependence of dual users. Although there is no established method

for the assessment of nicotine dependence in SLT users, there is some evidence that adolescent snus users, especially dual users, experience the symptoms of nicotine dependence at least as frequently as young cigarette smokers not using snus.¹² A Finnish study on adolescent smokers who smoked weekly showed that the more the subject had experimented with snus, the more nicotine addicted he would be.¹¹ We could not detect any studies on the nicotine dependence in young adult dual users.

The sale of SLT has been totally banned in Finland since the country joined the European Union in 1995. However, adolescents have continued to use SLT even after the sales ban. According to a national survey,¹⁷ the use of SLT among adolescents is again increasing after a decreasing trend, which lasted a couple of years; in 2009, 41% of Finnish 18-year-old males had experimented with SLT, 2.1% used it daily and 1.3% were daily SLT users who did not smoke.¹⁷ Adolescents have obtained snus mostly through friends or acquaintances, from tourist trips to neighboring countries, and also through their teammates in sport teams.¹⁸

This study aims to:

- (1) Describe snus use with the emphasis on dual use of snus and cigarettes in a study group of young male adults in Northern Finland.
- (2) To study how nicotine-dependent young adult SLT users are and how snus use is reflected in some indicators of nicotine dependence, such as the number of cigarettes smoked daily, heaviness of smoking index (HSI) and attempt to quit smoking in a group of daily smokers.

Methods

Study design and data collection

Detailed data description has been published elsewhere.¹⁹ In short, the study population consisted of military recruits who came from the Finnish speaking areas of northern Finland. Approximately 81–82% of an age group of male adolescents are recruited for

military service each year. During the time of data collection, all recruits were requested to answer anonymously a specific questionnaire about their sex, age, education, tobacco use and nicotine dependence. The overall response rate was 80%. The questions about the smoking and snus use habits were based on a Finnish nationwide study questionnaire, the Adolescent Health and Lifestyle Survey.¹⁷ The study was approved by the Ethical Committee of the Lapland Central Hospital in Rovaniemi, Finland.

Measurements

Study subjects were divided into three subgroups according to their snus usage: daily snus users, occasional snus users and subjects with no snus use. Daily users were those who reported using snus on a daily basis. Occasional users were those reporting using snus occasionally or who had experimented snus more than once. Subjects with no snus use had not experimented snus on more than a single occasion.

Dependence to snus was asked by the question: Which describes you the best? 'I think I'm addicted to snus': (i) not at all; (ii) to some extent; (iii) quite a lot; or (iv) very much. According to the answers, snus dependence was categorized as (i) no dependence; (ii) mild; (iii) moderate; or (iv) heavy dependence. Two groups of perceived dependence were formed: (i) no dependence or mild dependence; and (ii) moderate-to-heavy dependence.

The subjects were classified into four groups according to their smoking status: daily, occasional, non- and ex-smokers. Daily smokers reported using cigarettes on a daily basis. Occasional smokers were defined as subjects who currently smoked less than one cigarette daily but considered themselves as a smoker, or reported having smoked >50 cigarettes in the past. The non-smokers had smoked <50 cigarettes in the past and did not consider themselves as smokers. Ex-smokers reported that they had stopped smoking.

Daily tobacco grams here consist of a manufactured (1 g/cigarette) or self-rolled (1 g/cigarette) cigarettes, cigars (3 g/cigar) and pipefuls of tobacco (3 g/pipeful). Reports of tobacco consumption >45 g per day were considered as being unreliable and were not included into the analysis. The time to the first cigarette in the morning was inquired (<5, 6–30, 31–60 or >60 minutes after waking up), and nicotine dependence was assessed by HSI,^{20,21} which includes two questions: the number of daily cigarettes and the time to the first cigarette in the morning. Nicotine dependence was then classified as mild (0–1), moderate (2–4) or heavy (5–6). A question about whether the individual had made a previous attempt to quit smoking (Yes/No) and the number of quit attempts were included in the analysis.

Three educational groups were made: (i) primary school; (ii) vocational school; and (iii) high school or academic degree graduates.

Study subjects

Original data consisted of 1186 participants. The total number of females was small and inconclusive ($n = 12$), and therefore they were omitted from this study. From the 1174 male participants, 23 subjects with unreliable or incomplete answers to the crucial questions were excluded. Thus, the final study population consisted of a total number of 1151 male subjects.

Statistical analysis

The data were analysed using IBM SPSS Statistics, version 19.0, software. The mean values of age, in the snus use subgroups were compared using one-way analysis of variance. As daily tobacco gram had a right-skewed distribution, Kruskal–Wallis test was used to evaluate the difference between daily tobacco grams in daily smokers in the different subgroups of snus users. The statistical significance of the differences in frequency tables was tested by

chi-square test or Fisher's test when the assumptions of chi-square test were not fulfilled.

Results

Subject characteristics

Table 1 presents the subject characteristics according to snus use. The mean age of the study population was 19.4 years (min 18 years, max 25 years) with the vast majority (94.2%) between 18–20 years. Age did not differ significantly according to snus use habits: the mean age for those with no snus use or occasional snus use was 19.4 years, and 19.5 years for daily snus users (P -value of F -test 0.507). Snus use differed significantly between educational groups (table 1; chi-square test P -value < 0.001). Those who were high school graduates or had an academic degree had higher prevalence of no snus use (53%) compared with individuals with only primary schooling (21%) or vocational school graduates (34%).

Snus use, smoking and dual use

The prevalence of snus use according to smoking status is shown in table 2. Overall, 15.6% ($n = 179$) reported daily snus use, and 6.9% ($n = 79$) were dual users who consumed both products on a daily basis. Occasional smokers were twice more likely to be daily snus users than daily smokers (30.1% vs. 15.1%), whereas daily smokers were most often occasional snus users (66.3%). In the small group of former smokers, as many as 37.0% were using snus daily. Among non-smokers, 7.8% used snus daily, whereas most of them did not use snus (77.2%)—the prevalence with no snus use was much lower among smokers and ex-smokers (~20%).

Dependence to SLT

About one in six (18.2%) of daily snus users claimed that they had no dependence to snus, but 35.3% perceived that they had mild dependence, 34.1% had moderate and 12.4% heavy dependence to snus. In the comparison of the two perceived snus-dependence groups of daily snus users, occasional smokers who used snus on a daily basis were more likely to suffer from moderate-to-heavy dependence to snus (60.3%) than non- or daily smokers with daily snus use (35.5% and 38.9%).

Dependence to cigarettes

In the daily smokers, daily amount of cigarettes did not differ significantly according to snus use; the median value in daily tobacco grams smoked was 15.5 for those daily smokers who used snus daily compared with 15 for those with occasional snus use or with no snus use (Kruskal–Wallis test P -value > 0.05). Table 3 lists the variables describing nicotine dependence, i.e. first cigarette in the morning, HSI, attempt to quit smoking and number of unsuccessful quit attempts in a group of daily smokers according to their snus use habits. None of these variables correlated significantly with the snus use habits in daily smokers (Chi-square test P -value > 0.05). Some additional trends with specific interest were also noted. For example,

Table 1 Distribution of snus use habits by education

Education	No snus use <i>n</i> (%)	Occasional snus use <i>n</i> (%)	Daily snus use <i>n</i> (%)	Total <i>n</i> (%)
Primary school	23 (20.9)	66 (60.0)	21 (19.1)	110 (100.0)
Vocational school	196 (34.0)	282 (48.9)	99 (17.2)	577 (100.0)
High school or academic degree	243 (53.2)	155 (33.9)	59 (12.9)	457 (100.0)
Total	462 (40.4)	503 (44.0)	179 (15.6)	1144 (100.0)

Chi-square test P -value < 0.001.

Table 2 Distribution of snus use according to smoking status

Smoking status	No snus use n (%)	Occasional snus use n (%)	Daily snus use n (%)	Total n (%)
Non-smoker	315 (77.2)	61 (15.0)	32 (7.8)	408 (100.0)
Occasional smoker	47 (24.4)	88 (45.6)	58 (30.1)	193 (100.0)
Daily smoker	97 (18.5)	347 (66.3)	79 (15.1)	523 (100.0)
Ex-smoker	6 (22.2)	11 (40.7)	10 (37.0)	27 (100.0)
Total	465 (40.4)	507 (44.0)	179 (15.6)	1151 (100.0)

Chi-square test P -value < 0.001.

Table 3 Distribution of first cigarette in the morning, HSI and answer to the question 'Have you tried to quit smoking?' by daily smoking and concurrent use of snus

Variables	Daily smoker with daily snus use <i>n</i> (%)	Daily smoker with occasional snus use <i>n</i> (%)	Daily smokers with no snus use <i>n</i> (%)	Total <i>n</i> (%)	Chi-square test <i>P</i> -value
First cigarette in the morning (min)					
0–30	38 (49.4)	166 (48.5)	37 (39.4)	241 (47.0)	0.492
31–60	28 (36.4)	123 (36.0)	37 (39.4)	188 (36.6)	
>60	11 (14.3)	53 (15.5)	20 (21.3)	84 (16.4)	
Total	77 (100.0)	342 (100.0)	94 (100.0)	513 (100.0)	
HSI					
0–1	23 (30.7)	87 (26.0)	33 (37.1)	143 (28.7)	0.244
2–4	47 (62.7)	210 (62.9)	49 (55.1)	306 (61.4)	
5–6	5 (6.7)	37 (11.1)	7 (7.9)	49 (9.8)	
Total	75 (100.0)	334 (100.0)	89 (100.0)	498 (100.0)	
Attempt to quit smoking					
Yes	50 (51.5)	212 (61.1)	50 (64.9)	312 (59.9)	0.147
No	27 (48.5)	135 (38.9)	47 (35.1)	209 (40.1)	
Total	77 (100.0)	347 (100.0)	97 (100.0)	521 (100.0)	
Number of unsuccessful quit attempts					
1–2	26 (60.5)	125 (62.5)	31 (70.5)	182 (63.4)	0.725
3–4	9 (20.4)	47 (23.5)	9 (20.5)	65 (22.6)	
≥5	8 (18.6)	28 (14.0)	4 (9.1)	40 (13.9)	
Total	43 (100.0)	200 (100.0)	44 (100.0)	287 (100.0)	

dual daily users were more likely to smoke their first cigarette in the morning in 30 minutes (49.4% vs. 39.4%; chi-square test P -value 0.492). This was reflected also in HSI index: it seemed that dual users had lower HSI index than daily smokers without snus use (HSI 0–1, 30.7% vs. 37.1%). In addition, dual users had less attempts to quit smoking than smokers without snus use (51.5% vs. 64.9%). Among those who had tried to quit, dual users had higher number of unsuccessful quit attempts (≥5 quit attempts, 18.6% vs. 9.1%). In all, these findings might indicate that dual users were more dependent to snus than exclusive smokers.

Discussion

Dual use of snus and cigarettes is common among young adults in Northern Finland, despite the sales ban throughout the country. Occasional smokers often used snus on a daily basis (~30% vs. 8% for non-smokers), and they were also more likely to consider themselves as addicted to these products than non- or daily smokers who used snus. Daily smokers were most often occasional snus users (66.3%), and those with dual use smoked a similar number of cigarettes per day as daily smokers who did not use snus. Concomitant snus use seemed to increase the dependence to cigarettes in dual users, although the difference did not reach statistical significance.

In our study group of young military recruits not only smoking¹⁹ but also snus use was more common in conscripts with a lower educational level. In recent Swedish study of adults, snus use (exclusive and dual use) was also associated with a lower educational level.²² In a Norwegian study, adolescents' and young adults' exclusive snus use was not associated with educational status, but dual use did associate with schooling—although exclusive smokers were the most likely to have less education.²³

Daily snus use in our study group was more common as compared with the national prevalence for 18-year-old males in Finland (15.6% vs. 2.1%).¹⁷ A total of 6.9% of the study cohort members were 'heavy dual users' who used both cigarettes and snus daily. According to the Swedish National Institute of Public Health, in 2009, 22% of Swedish 16–29-year-old males used snus daily, and the number of daily dual use was lower than in our study: 2% were daily dual users of snus and cigarettes.²⁴

Only 20.1% of smokers had no snus use. It does seem that young males in Finland use snus in addition to cigarettes, and in young adults, only a few snus users are 'switchers' [3.2% ($n=22$) of all snus users]. Northern Finland is not far from Sweden where SLT products are allowed. This could partly explain the high prevalence of snus use in this region. It is also possible that being in the army influences to the use of tobacco, in addition to cultural differences, inside the country.

About 80% of daily snus users felt themselves addicted to snus to some extent. Interestingly, those daily snus users who smoked occasionally were most likely to have moderate-to-heavy dependence to snus, whereas non-smokers and daily smokers that used snus daily did not differ in their degree of perceived snus dependence.

In smokers, daily tobacco consumption was high (~15 g/day), despite the concurrent snus use, i.e. dual use did not significantly decrease the number of cigarettes smoked per day in these daily smokers, and therefore snus use did not seem to have a role at reducing the health damages related to cigarette smoking in young adult daily smokers. The median of cigarettes smoked per day is only a crude estimate, and the result needs to be interpreted with caution: it is possible that smokers who otherwise would be the heaviest smokers may be able to reduce the number of cigarettes they smoke each day by concurrent snus use.

If daily smokers were inclined to substitute cigarettes by using snus, it would be anticipated that those who use snus would smoke their first cigarette later in the morning than non-snus-using smokers. However, in daily smokers, the pattern of smoking the first cigarette in the morning did not differ significantly according to their snus use habits. In fact, there was trend that dual users smoked the first cigarette earlier in the morning, reflecting to higher HSI index in dual users than in daily smokers without snus use. Dual users appeared less likely to make quit attempts, although this trend was also statistically insignificant. In all, it seemed that dual users were more dependent on snus than smokers without snus use, but the statistical power of our study could not distinguish this difference. These trends should be further investigated in a study with more statistical power.

In a Swedish study on adolescents, dual users seemed to be more dependent on snus. They found that dual users consumed fewer cigarettes weekly than exclusive smokers, but that dual users seemed to exhibit greater nicotine dependence than exclusive smokers, based on indicators such as time to first cigarette in the morning.¹² In that study, exclusive smokers and dual users had similar pattern of unsuccessful quit attempts in their history. It is noteworthy that they categorized current tobacco use as consumption of tobacco at least once a month.

One limitation of this study is the cross-sectional design. More longitudinal studies are needed to investigate the causal relationships related to dual use, dependence and smoking cessation in young adults. Another limitation is that we inquired only about the current use of snus, but did not seek a more detailed snus use history, e.g. duration of the use, daily snus consumption or

previous SLT use (ex-snus use). Also, the statistical power of our study is restricted, and therefore some distinguishable differences might not reach statistical significance.

In conclusion, dual use of cigarettes and snus is common in young adults, but only a few have quit smoking with or without snus use. In fact, snus use does not seem to substitute for cigarettes in young adult daily smokers; rather, snus seems to be additional unhealthy habit in these individuals.

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Conflicts of interest: None declared.

Key points

- Dual use of snus and cigarettes is common in Finnish young adults, despite the sales ban in the area.
- Those with dual use smoked equal number of cigarettes per day as smokers who were not snus users, and might be more dependent to nicotine than exclusive smokers.
- Very few snus users were 'switchers' (ex-smokers).
- The role of snus in reducing smoking in young adults is debatable.

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