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Is smokeless tobacco a healthier option in patients with AUD? A follow-up study during treatment

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Abstract

Introduction Smoking is negatively related to mental health, but there is a paucity of research on the relationship between the use of smokeless tobacco, such as snus, and mental health outcomes, especially in people with alcohol use disorders (AUD). The aim of the present study was to examine the development of mental distress and quality of life (QoL) among AUD patients in treatment who did or did not use snus.

Method The study included 128 AUD patients (27% female) from three rehabilitation clinics in Eastern Norway who were interviewed at admission, at 6 weeks, and after 6 months. Patients were asked about their mental health-related problems, alcohol, and substance use, QoL, and physical activity. Information about tobacco use was gathered with the questions “Do you smoke cigarettes?” and “Do you use snus?”, with follow-up questions “How often?”.

Result There were 39 current snus users (31%), of which 20 were also current smokers (dual users). Seventy-five patients (59%) were smokers only, and only 14 (11%) patients were abstainers. Those who used snus only had a lower severity of dependence score than the other groups ($p < 0.05$). The dual use group reported lower QoL than the no tobacco use group. In a regression model adjusted for sex and age, smokers and dual users, but not users of snus, had higher levels of mental distress and poorer QoL compared to nontobacco users ($p < 0.05$). There were no differences between tobacco groups at follow-ups.

Conclusion In this study, among AUD patients, snus users reported QoL and mental distress close to that of non-smokers, indicating a lower problem load among snus users compared to smokers.

Implications Previous studies have shown conflicting results regarding the potential harm reduction effect of snus use among patients with AUD who smoke regarding their tobacco use, quality of life and mental health problems. This study suggests that snus use could also be a viable alternative to smoking for patients with addictions.

Introduction

The Scandinavian smokeless tobacco product “snus” is a moist oral tobacco product that is placed behind the upper lip, mostly in portioned sachets. The composition of smokeless oral tobacco products may differ between geographical regions and contain different ingredients in addition to tobacco [12, 30]. Snus is air-cured tobacco mixed with salt and water and processed using techniques resembling pasteurization. Sale of snus is prohibited in all EU countries except Sweden, but it is available in non-EU countries such as Norway and

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Switzerland. In Norway, snus is now more prevalent in use than smoking and is used by approximately 15% of the population aged 16 to 74 years, approximately twice the number of smokers [31].

In contrast to the steeply declining smoking rates in the general population, 75% of people with substance use disorders (SUD) are still smokers [18]. Together with other unhealthy lifestyle factors, this may contribute to the large increase in death rates, mainly due to cardiovascular diseases [1, 2]. It is of interest to reduce smoking among people with SUD [22], as this may also increase the success of SUD treatment [23].

Studies have shown considerably lower health risks associated with snus smoking than with cigarette smoking [3, 4, 12, 34]. In countries with higher use of alternative nicotine products, a lower smoking prevalence has been observed, indicating that alternative nicotine products may reduce smoking [8, 27]. Sweden is a country with a high prevalence of snus use and simultaneously one of the countries within the EU with the lowest prevalence of tobacco-related disease and is especially low in lung cancer among men [4].

Snus and alternative tobacco and nicotine products may even have a role in assisting smoking reduction and cessation [28]. A study following former smokers over seven years found that approximately 80% reported snus to be of great importance to succeed with smoking cessation [21], and even in randomized smoking cessation trials, snus has shown efficacy [14]. However, a meta-analysis showed little effect, possibly due to poor quality studies [32].

We know from general population studies that there seems to be a close relationship between smoking and alcohol use [36]. However, even snus users have 60% higher estimated yearly excess consumption of alcohol and another drinking style than tobacco nonusers [38]. Another follow-up study found that snus use was associated with an increased risk of alcohol use disorders (AUD) with a dose–response relationship independent of smoking status [25].

Additionally, from several population studies, we know that smoking and the use of alcohol independently and together increase the risk of poor mental health [9, 15]. In an earlier article, we were able to show that compared to smokers, non-smokers had a lower drop-out rate, were less distressed and had a higher quality of life [18].

Few studies have examined the use of snus and the possible relationships to mental health symptoms and quality of life among people with AUD. A follow-up study of alcohol-dependent individuals in alcohol treatment facilities found that both smokers and those who used snus had an earlier alcohol debut than tobacco

never-users, but there was no difference in treatment outcome between the groups [29].

The aim of this study is thus to examine the effects of snus, cigarette smoking and dual use on mental distress and quality of life among AUD patients in treatment and to further study longitudinal effects on the same parameters, including drop-out rates.

Materials and methods

Study participants

Participants were recruited from three inpatient rehabilitation clinics located in Eastern Norway, as previously detailed by (Bolstad et al., 2023). The study included patients diagnosed with AUD (n=113) and/or other SUD (n=37) according to the International Classification of Diseases, 10th Revision (ICD-10). Patients were excluded if they had psychosis, cognitive impairments, severe physical illnesses, or lacked proficiency in a Scandinavian language. Eligible patients were informed about the study, and 128 individuals provided written informed consent. Data were collected at one week post-admission, at six weeks, and at six months. Information on mental health, substance dependence, and tobacco use was gathered through interviews by trained staff, while data on mental distress, physical activity, and alcohol dependence were obtained via self-report questionnaires.

Ethical considerations

The study was approved by the Norwegian Regional Ethics Committee (ref. no. 2017/1314). We ensured that all methods were used in accordance with relevant guidelines and regulations.

Measures

Background variables

Information about age, sex and educational level was collected initially when meeting the participant. Waist circumference, weight and height were measured, and body mass index (BMI) was calculated.

The International Physical Activity Questionnaire short version (IPAQ-S) was used to measure the level of physical activity [6, 17]. Time spent walking or doing moderate or vigorous exercise weekly was reported in a seven-item questionnaire, and the participants were placed in categories of low, moderate, or high physical activity level. The variable was dichotomized as low vs. moderate/high for the purpose of this study.

AUD severity was measured using the Norwegian version of the Severity of Dependence Scale (SDS) [10, 16]. The SDS consists of five four-level (0–3) Likert items mapping impaired control over drinking, anxiety, and preoccupation with drinking the past year. Item

responses are summed into a score where a higher score indicates more severe AUD. Cronbach's alpha for SDS in our study was 0.86.

The Mini International Neuropsychiatric Interview (MINI) version 6.0 was used to identify substance use disorder. Module I (alcohol use/addiction) and J (substance use/addiction) were performed according to the manual by trained personnel.

Tobacco habits

Tobacco use habits were assessed through questions during an interview. Study participants were asked, "Do you smoke cigarettes?" and "Do you use snus?" Those who responded positively were then asked how often they used cigarettes/snus ("daily"/"occasionally"). Individuals who reported daily use of cigarettes or snus were classified as smokers or snus users, respectively, while those who reported no or occasional use were categorized as non-smokers or nonusers of snus.

Outcome measures

Mental distress was assessed using the 10-item version of the Hopkins Symptom Checklist (HSCL-10) [7], a widely recognized self-report tool that measures common symptoms of depression and anxiety experienced over the past week. The HSCL-10 includes ten items rated on a four-point Likert scale, ranging from "not at all" (1) to "extremely" (4). The responses are summed and then divided by the number of items to generate an individual score between 1 and 4, with higher scores indicating higher level of mental distress. The Cronbach's alpha for the scale was 0.91.

Quality of life was measured by the five-item Quality of Life (QoL-5) instrument to measure patient satisfaction with life in general [19]. This taps into self-perceived quality of mental and physical health and relationship to oneself and to significant others. There are five ordinal response alternatives ranging from (1) 'Very good' to (5) 'Very poor'. The raw scores are transposed and inverted into a total score between 10 and 90, where a higher score indicates better quality of life. Chronbach's alpha was 0.60.

Statistical analyses

Due to non-normal distributions of the variables, medians and percentiles are used for descriptive statistics, and nonparametric tests are used to assess group differences. Bivariate linear regression models were built to examine the effect of snus and cigarette smoking on mental distress and quality of life. Analyses are performed using Stata 17.0.

Results

There were 39 (31%) current snus users at admission, 20 of whom were also current smokers. Seventy-five (59%) patients were smokers only, and only 14 (11%) patients abstained from both (Table 1).

More men than women were dual users of snus and tobacco compared to the no tobacco use group ($p=0.002$), and the dual users ($p=0.009$) and snus only users ($p=0.018$) were younger. Among the smokers, fewer had education at the upper secondary level ($p=0.006$) (Table 1). Approximately one-third of both non-smokers and snus users reported smoking earlier in their life. Those who used snus only had a lower SDS score than the non-tobacco users ($p=0.002$). There were more patients among the dual users than nontobacco users with an SUD other than AUD ($p=0.016$).

Table 2 shows the development in self-reported mental distress (HSCL-10) from baseline through the 6-week to six-month follow-up. At baseline, the dual use group reported poorer QoL than nontobacco users ($p=0.015$). Overall, the snus users reported QoL scores intermediate to those seen for smokers and abstainers. The treatment drop-out was higher for smokers and dual users. However, none of these differences were statistically significant.

In the bivariate regression with self-reported mental distress and quality of life at baseline as outcome variables, we controlled for age and sex (Table 3). Smokers and dual users reported significantly higher mental distress and significantly poorer quality of life than those not currently using tobacco (all $p<0.05$). Users of snus did not differ from those with no tobacco use.

Discussion

The aim of this study was to examine cross sectional and longitudinal effects of snus, cigarette smoking and dual use on mental distress and quality of life. The main finding from this study is that smokers, either those just smoking or those using snus in addition, reported higher mental distress and lower quality of life than those abstaining from tobacco products. Those using snus only did *not* report higher mental distress or lower quality of life compared to tobacco abstainers. There was a non-significant tendency for more drop-out among smokers with or without simultaneous snus use.

Several earlier studies have shown that smokers have worse mental health with a higher risk of several mental health outcomes compared to non-smokers in the general population [40, 42]. Most studies also show a close relationship between poor mental health and

Table 1 Baseline measures for patients according to the four different tobacco consumption habits (n = 128)

	No tobacco n = 14 (11)	Smoke 75 (59)	Snus 19 (15)	Dual 20 (16)	Overall	No v smk	No v snus dual	No v dual
	n = 14 (11%)	75 (59%)	19 (15%)	20 (16%)	p	p	p	p
<i>Socio-demographics</i>								
Sex (female) n (%)	7 (50)	22 (29)	4 (21)	1 (5)	0.019*	0.212*	0.136*	0.004*
Years of age (median, IQR)	57.1 (51.5–58.8)	53.8 (46.8–58.2)	42.9 (33.3–51.7)	40.7 (32.4–53.7)	<0.001	0.329	0.018	0.009
Education (> upper secondary) n (%)	12 (100)	33 (60)	12 (92)	10 (71)	0.007*	0.006*	1.000*	0.100*
<i>History of tobacco use</i>								
Smoked before n (%)	5 (36)	–	7 (37)	–	–	–	0.947	–
Used snus before n (%)	1 (8)	9 (12)	–	–	–	1.000*	–	–
<i>Somatic health</i>								
BMI (median, IQR)	27.2 (25.6–31.7)	26.1 (22.9–29.3)	26.7 (22.4–28.7)	27.5 (25.1–29.1)	0.429	0.198	0.258	0.555
Waist measure (median, IQR)	95 (91–113)	102 (90–110)	99 (88–105)	102 (94–111)	0.763	0.727	0.356	0.927
<i>Lifestyle</i>								
Low level of physical activity n (%)	5 (45)	34 (64)	4 (31)	8 (57)	0.152*	0.315*	0.675*	0.561
<i>Mental health</i>								
Current major depression n (%)	2 (14)	12 (16)	3 (17)	5 (25)	0.790*	1.000*	1.000*	0.672*
<i>Substance use related measures</i>								
Severity of dependence (median, IQR)	11 (10–12)	10 (7–12)	8 (1–10)	10 (7–11)	0.047	0.131	0.002	0.126
Alcohol use disorder n (%)	12 (100)	56 (90)	13 (81)	13 (81)	0.287*	0.581*	0.238*	0.238*
Other substance use disorder n (%)	1 (8)	13 (21)	5 (31)	9 (56)	0.019*	0.442*	0.196*	0.016*

Statistical significance of group differences was assessed with Kruskal–Wallis and Mann–Whitney tests for continuous variables. Chi square test and Fischer's exact test* (expected cell count < 5) were used to test group differences of categorical variables. The significance level was set 0.05 (bold)

Table 2 Levels of mental distress and quality of life baseline and follow-ups and drop-out rate at follow-ups

		No tobacco	Smoke	Snus	Dual	Overall test p	No v smk	No v snus	No v dual
						p	p	p	p
<i>HSCL-10</i>									
Baseline (n = 97)	Median (IQR)	2.0 (1.4–2.4)	2.0 (1.5–2.6)	1.8 (1.2–2.2)	2.2 (1.9–2.6)	0.249	0.350	0.584	0.222
6 weeks (n = 75)	Median (IQR)	1.6 (1.4–2.4)	1.8 (1.4–2.2)	2.0 (1.2–2.4)	2.0 (1.7–2.3)	0.846	0.818	0.939	0.454
6 months (n = 44)	Median (IQR)	1.6 (1.0–1.7)	1.8 (1.4–2.2)	1.6 (1.1–2.0)	1.9 (1.6–1.9)	0.454	0.146	0.633	0.180
<i>QoL</i>									
Baseline (97)	Median (IQR)	67 (53–70)	53 (40–63)	60 (43–70)	53 (43–57)	0.126	0.069	0.464	0.015
6 weeks (n = 75)	Median (IQR)	65 (63–70)	63 (53–70)	63 (50–67)	57 (47–67)	0.557	0.319	0.394	0.266
6 months (n = 44)	Median (IQR)	70 (67–77)	63 (53–70)	67 (63–70)	63 (53–67)	0.261	0.139	0.510	0.152
<i>Treatment drop-out</i>									
6 weeks	n (%)	0 (0)	10 (14)	3 (17)	0 (0)	0.134	0.349	0.245	–
6 months	n (%)	1 (20)	29 (54)	3 (33)	6 (46)	0.426	0.195	1.000	0.596

Statistical significance of group differences was assessed with Kruskal–Wallis and Mann–Whitney tests for continuous variables, and Fischer's exact test for categorical variables (expected cell count < 5). The significance level was set at 0.05 (bold)

Table 3 Bivariate linear regression models of effect of tobacco habit on mental distress (HSCL-10) and quality of life (QoL)

Reference		HSCL-10				QoL			
		Unadjusted		Adjusted ^a		Unadjusted		Adjusted ^a	
		β	<i>p</i>	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
Sex	Male	0.63	<0.001	0.71	<0.001	-3.35	0.350	-5.96	0.117
Age	Continuous	-0.01	0.247	-0.01	0.322	0.08	0.587	0.02	0.888
Tobacco habit									
Smoke	No tobacco	0.27	0.237	0.48	0.026	-8.43	0.087	-10.21	0.044
Snus	No tobacco	-0.12	0.676	0.08	0.757	-4.04	0.494	-5.94	0.337
Dual	No tobacco	0.24	0.407	0.57	0.046	-11.34	0.060	-14.37	0.031

^a adjusted for age and sex. The significance level was set at 0.05 (bold)

smoking in AUD patients [18], but some studies end up with an opposite finding [33].

Even if the snus user group did not differ from the tobacco abstainers, they seemed to place themselves in a middle position concerning mental health and quality of life. Even other studies have shown an increased risk for depression and anxiety among snus users, but less so than for smokers [3, 35]. Additionally, for health-related quality of life, a cross-sectional study found that snus use was associated with a lower quality of life, but less so than for smokers [37].

Smokers had lower educational levels than nontobacco users and snus users. This reflects findings from general population studies where smoking is associated with lower socioeconomic status [5]. The lower age found among snus users might reflect changes in society, where young people use snus more often than the elderly [26]. There was also a trend towards a higher level of physical activity among snus users. A positive association between snus use and sport and exercise has been described by others [13, 41].

Another interesting finding was that those who only used snus, but not smokers or dual users, had a lower severity of dependence score than nontobacco users. This is in contrast to a Swedish study that did not find any difference in different parameters of severity of dependence according to smoking status either at baseline or follow-up according to smoking status [29].

The question remains whether the current results can be used as an argument for snus being a harm reduction measure for smokers. Despite small numbers in the present study, more than 30% of both non-tobacco users and snus users were previous smokers, which might indicate that snus might be used as a quitting strategy in this population. A Norwegian repeated cross-sectional representative survey found that 26% of those quitting smoking used snus as their preferred method and that snus was also the method with the highest success rate

[21]. In 2019 the US Food and Drug Administration (FDA) granted a modified risk orders to Swedish Match USA, Inc. for eight snus smokeless tobacco products that may be advertised with specific information about the lower risks of certain health effects using the products compared to smoking cigarettes (<https://www.fda.gov/tobacco-products/advertising-and-promotion/fda-authorizes-modified-risk-tobacco-products>).

In the present study, a relatively high proportion both smoked and used snus. This was related to lower quality of life and higher severity of dependence. This could be used as an argument against introducing snus as a harm reduction measure. Previous studies have shown that such dual use hampers smoking cessation and might result in high smoking rates even among young adults [11]. However, other studies have found that snus use is associated with a higher likelihood of quitting smoking within the first 5 years of using snus [20].

Last, the question remains regarding how snus use may contribute to addiction. We know from other research that continued smoking hampers addiction treatment [39]. We still lack research on the implications of snus usage. One study indicated that other mechanisms of addiction may contribute to the maintenance of snus use than other addictive substances [24].

There are some limitations of this study. First, we have no measures to validate the self-reported level of smoking and snus use. Second, most of the results are based on cross-sectional data, limiting the possibility of drawing conclusions on the directions of our findings. Third, the sample size is small, and we cannot rule out whether our sample is representative of all people entering AUD treatment facilities. A small sample size also restricts the number of variables we can use and increases the risk of type II errors.

The conclusion from this study is that snus users have levels of mental health problems and quality of life closer to those seen for current non-smokers in an AUD

treatment population. A possible implication from this study is that snus might be a safe smoking cessation tool in this group of patients. Specific attention should be given to patients with dual use of snus and tobacco.

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Author contributions

LL wrote the main manuscript text and IB did the analysis and prepared tables 1–3. JGB had the idea and provided the data. All authors reviewed the manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Ethics approval was obtained from the Norwegian regional ethics committee: 2017/1314 REK sør-øst B. All participants signed the informed consent form including information about the study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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