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Background and purpose

Even though smoking is decreasing in many Western countries, the use of smokeless tobacco or nicotine pouches is common. Nicotine content in different smokeless tobacco products varies in on a large scale as well as the habit of the use of the products. Cotinine is the predominant metabolite of nicotine and is typically used as a biomarker for exposure to tobacco use.

The study aims to compare serum cotinine levels to self-reported use of smokeless tobacco products, tobacco smoking, dual-use, or non-users. Another aim is to analyze serum cotinine levels among those who reported daily passive smoking.

Methods

Data collection for the Northern Finland Birth Cohort, Oulu, Finland, was used in the study. In 2012, when the participants were 45-46 years old, the latest comprehensive health research was carried out, including clinical examination and questionnaire.

In the present study, data comprises all participants who use smokeless tobacco products (n= 163, dual users included), and control groups included only smokers (n=50) and non-tobacco users (n=50). In addition, only participants with serum samples available for analyses, were included. Most (97.7%,
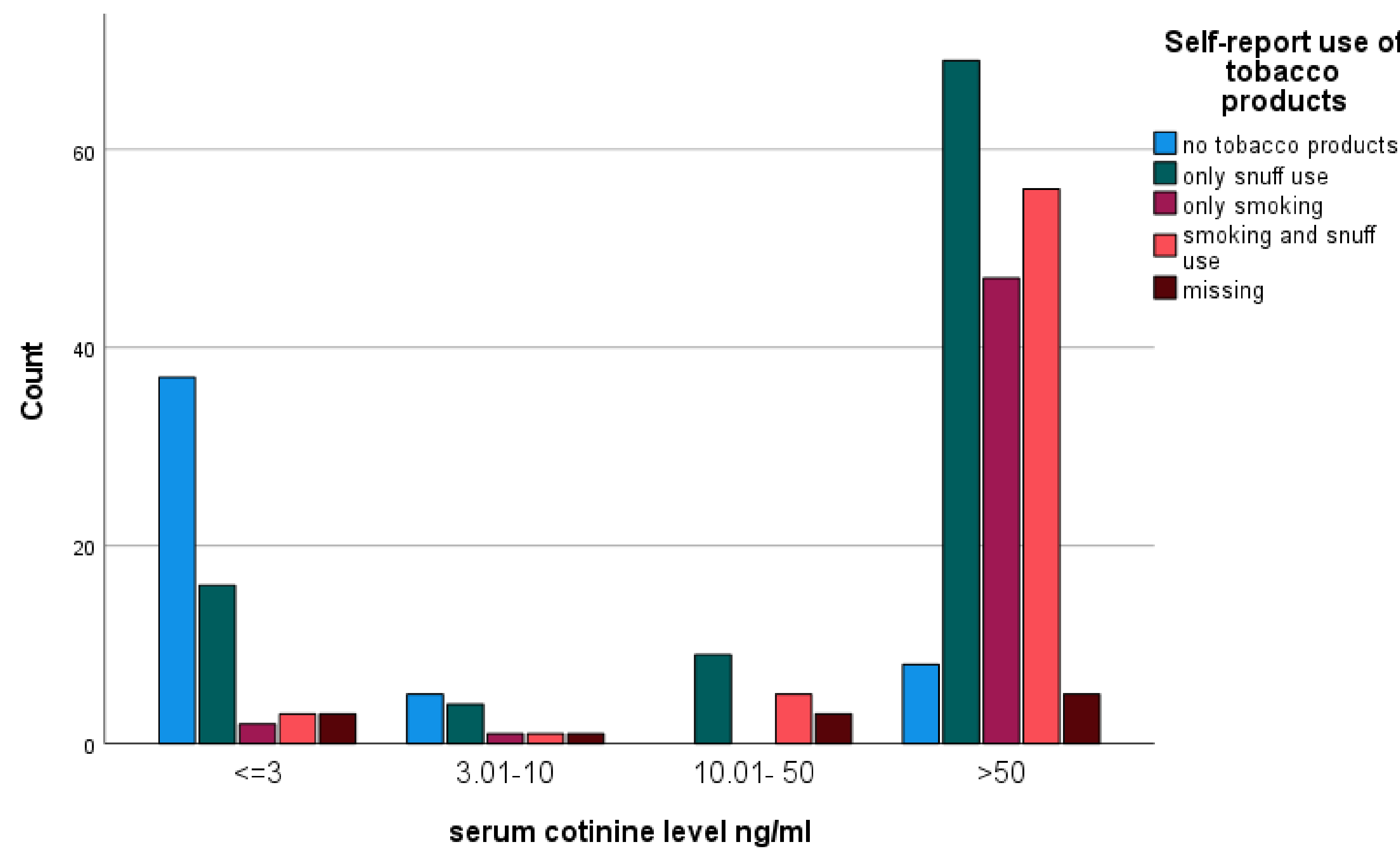

Figure 1. Distribution of study population in categorised cotinine value groups

Questionnaire

The following questions were asked:

- Do you use smokeless tobacco?
- Do you currently smoke?
- How many hours a day you are on the premises, where you must breathe in smoke from others?

Cotinine analysis

Estimation of serum cotinine in the serum samples was carried out by the qualitative and semi-quantitative OTI Cotinine Serum MICRO-PLATE EIA® immunoassay. Because of high values in the first analyses, two thirds of the

Statistics

For the analyses, the participants were categorized into four groups based on their use of tobacco products (non-use n=50, only smokeless tobacco use n=98, only smoking n=50 and dual use n=65).

Serum cotinine level was categorized in four groups: ≤3 ng/ml, >3 ng/ml ≤ 10.0 ng/ml, >10.0 ng/ml≤ 50.0 ng/ml, and > 50 ng/ml.

Statistically significances were tested by One-way ANOVA and Tukey´s Post-Hoc tests. The analyses were made in the SPSS program, and statistical significance was set at $p < 0.05$.

	Mean	N	Min, Max	SD
No tobacco products	41.7	50	0.01; 331.5	96.1
Only snuff use	177.2	98	0.01; 403.2	124.3
Only smoking	238.3	50	0.01; 325.4	80.9
Smoking and snuff use	218.9	65	0.07; 319.3	91.8
Missing self-report information	104.2	12	1.20; 281.7	117.9
Total	170.3	275	0.01; 403.2	124.3

Table 1. Mean, minimun, maximum, and SD cotinine values in four groups of using tobacco products.

Conflict of interest

Results

Figure 1 shows study population distribution in categorized cotinine groups. Respective figures of mean values of serum cotinine levels (ng/ml) among non-users, only smokeless tobacco use, only smokers and dual users were seen in Table 1. There were statistically significant difference in mean values between non-users and the rest of the groups.

Twenty people (7.6%) of the study population were exposed to tobacco smoke, and only four of them did not report to use tobacco products by themselves. The mean cotinine value of them was 78.8 (min 1.82; max 307.9)

Conclusions

Serum cotinine levels varied on a large scale in different self-reported tobacco use groups. Very low to high levels were measured in all groups, even in the non-user group. The highest cotinine levels were calculated from only smokeless tobacco users. Passive smoking was rare in the study population and most of them use tobacco products also itself. It may be concluded that self-reported information on tobacco product use is uncertain and may not tell us the truth of a person's actual