

Variations of toxic and carcinogenic constituents in nasvai: call for systematic research and regulation

INTRODUCTION

Nasvai (sometimes referred to as naswar or nass) is a smokeless tobacco product used in central Asian countries such as Uzbekistan, Tajikistan, Kyrgyzstan, Turkmenistan and Kazakhstan. It is prepared by mixing locally grown tobacco with slaked lime or alkaline tree ash, and adding various combinations of flavouring and colouring ingredients. Nasvai can be produced in cottage industry settings or be custom made, and is sold either prepackaged in small containers or in bulk. While data on the prevalence of nasvai use in central Asian countries are scarce, the existing reports indicate that it may exceed that of smoking: 22.3% of adult men in Uzbekistan and 40% of rural adult men in Tajikistan reported using nasvai, while smoking prevalence estimates in the same populations were 19.6% and 8.7%, respectively.^{1 2} The largely unregulated production and accessibility of nasvai suggest that actual consumption may be even greater.

Consistent with the evidence that certain types of smokeless tobacco increase risk of oral cancer, including tobacco with lime in South Asia, the few published studies suggest that the use of nasvai may increase the risk of precancerous oral lesions and oral cancer.³⁻⁵ Analysis of toxic and carcinogenic constituents in nasvai products on the market in central Asian countries could provide important information for better understanding of their harmful potential. We report here initial findings of substantial differences in the levels of several important constituents between two versions of nasvai recently purchased in Kyrgyzstan and Uzbekistan.

METHODS

Two samples of nasvai—a prepackaged product with the manufacturer's label and a bulk unlabelled product (figure 1)—were obtained from Bishkek, Kyrgyzstan, in February 2015, and from Tashkent, Uzbekistan, in August 2015, respectively. We analysed moisture content, pH, nicotine and unprotonated nicotine, carcinogenic nitrosamines *N'*-nitrososornicotine (NNN), 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) and 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL). We also analysed 13



Figure 1 The two versions of nasvai analysed in this study: (A) bulk unlabelled product placed in a plastic bottle (Uzbekistan); (B) manufactured prepackaged product (Kyrgyzstan).

polycyclic aromatic hydrocarbons (PAH), which included benzo[*a*]pyrene and other carcinogenic PAH, as well as non-carcinogenic phenanthrene and pyrene, which can be present at high levels in smokeless tobacco.⁶ The analyses were carried out using our routine standard analytical protocols.⁶

RESULTS

The bulk version of nasvai contained higher levels of total nicotine and had higher pH, resulting in more than sixfold higher levels of unprotonated nicotine

than the prepackaged product (table 1). Comparison of nicotine levels per gram dry weight revealed that tobacco used in the preparation of the bulk version of nasvai contained almost 10-fold higher levels of nicotine as compared with the prepackaged product: 55.2 ± 1.7 mg/g dry weight vs 6.21 ± 0.08 mg/g dry weight, respectively. The levels of carcinogens NNN, NNK and NNAL were 2–3 times higher in the prepackaged version of nasvai than in the bulk sample (table 1). Only 2 of the 13 analysed PAH—phenanthrene and pyrene—were present at levels above the limit of quantitation, with the amounts being not different between the two nasvai varieties.

DISCUSSION

The drastic differences in the chemical profile of the two versions of nasvai analysed in our study can have important public health implications. Unprotonated nicotine level in the bulk variety of nasvai is among the highest reported for tobacco products. Higher levels of the biologically available unprotonated nicotine in tobacco products can lead to higher levels of addiction.⁷ Furthermore, high alkaline pH, as that found in the bulk version of nasvai, can result in substantial damage to oral mucosa at the place of product application, leading to tissue necrosis and a sustained inflammatory state, and potentially facilitate the absorption by the damaged oral tissue of toxicants and carcinogens present in nasvai. While PAH levels measured here are relatively low as compared to products made with fire-cured tobaccos, the levels of the oral and oesophageal carcinogen NNN in the prepackaged nasvai are comparable with those found in US moist snuff.⁶

Table 1 Levels of toxic and carcinogenic constituents in two samples of nasvai

Constituent or measure*	Prepackaged nasvai	Bulk nasvai
Moisture, %	12.8±0.6	49.3±0.6
pH	8.66±0.03	10.02±0.07
Total nicotine, mg/g	5.42±0.04	28.0±0.7
Unprotonated nicotine, %	81.3±0.9	99.0±0.1
Unprotonated nicotine, mg/g	4.41±0.06	27.7±0.6
NNN, ng/g	1189±68	642±53
NNK, ng/g	192±21	71±4
NNAL, ng/g	2.8±0.3	1.7±0.7
Phenanthrene, ng/g	13.5±0.5	9.0±0.4
Pyrene, ng/g	7.6±0.3	6.8±0.3

NNK, 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone; NNN, *N'*-nitrososornicotine; NNAL, 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol.

*The results of constituent levels expressed per gram wet weight (as is being used by consumers). Each constituent was analysed in triplicate; results are presented as mean±SD of the three measurements.

Research letter

Our observations do not necessarily indicate that the corresponding differences will be consistently observed between the prepackaged and bulk versions of nasvai sold in central Asian countries. For instance, the previously reported levels of some of these constituents in a single unidentified sample of nasvai from Uzbekistan (referred to as nasway) do not match the pattern of either of the two products analysed in our study.⁸ Our findings indicate, rather, that given the lack of consistency in product 'recipe' across various cottage or individual producers, the chemical profile of nasvai products may vary considerably from vendor to vendor, with consumers and regulatory agencies being unaware of these variations.

While the scope of this preliminary analysis is very limited, the results call for research to better characterise the chemical diversity of nasvai, with particular focus on the variations across custom-made products. Comprehensive and systematic surveillance of nasvai contents, use, associated exposures and health outcomes will generate critical data for the development and implementation of regulatory policies designed to protect public health in central Asian countries.

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