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

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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 flavoring and coloring ingredients. Nasvai can be produced in cottage industry settings or custom-made, and is sold either pre-packaged in small containers or in bulk. While data on the prevalence of nasvai use in Central Asian countries is 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 to use 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.

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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 pre-packaged product with the manufacturer’s label and a bulk unlabeled product (Figure 1) – were obtained from Bishkek, Kyrgyzstan in February 2015 and Tashkent, Uzbekistan in August 2015 respectively. We analyzed moisture, content, pH, nicotine and unprotonated nicotine, carcinogenic nitrosamines *N*'-nitrosornicotine (NNN), 4-(methylnitrosamino)-1-(3-pyridyl)-butanone (NNK), and 4-(methylnitrosamino)-1-(3-pyridyl)-butanol (NNAL). We also analyzed 13 polycyclic aromatic hydrocarbons (PAH) which included benzo[*a*]pyrene and other carcinogenic PAH, as well as non-carcinogenic phenanthrene and pyrene that can be present in smokeless tobacco at high levels.⁶ The analyses were carried out by 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 6-fold higher levels of unprotonated nicotine than the pre-packaged product (Table 1). Comparison of nicotine levels per gram dry weight reveals that tobacco used in the preparation of the bulk version of nasvai contains almost 10-fold higher levels of nicotine as compared to the pre-packaged 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 pre-packaged version of nasvai than in the bulk sample (Table 1). Only two of the 13 analyzed 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 analyzed 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 level 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 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 esophageal carcinogen NNN in the pre-packaged nasvai are comparable to those found in the US moist snuff.⁶

Our observations do not necessarily indicate that the corresponding differences will be consistently observed between the pre-packaged 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 analyzed in our study.⁸ Our findings rather indicate 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 characterize 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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References

1. Usmanova G, Neumark Y, Baras M, et al. Patterns of adult tobacco use in Uzbekistan. *Eur J Public Health*. 2012; 22:704–707. [PubMed: 21908387]
2. Akkazieva, B., Tello, J., Smith, B., et al. Better non-communicable disease outcomes: challenges and opportunities for health systems. Tajikistan Country Assessment. Copenhagen: WHO Regional Office for Europe; 2015.
3. National Cancer Institute, Centers for Disease Control and Prevention. Smokeless Tobacco and Public Health: A Global Perspective. NIH Publication No. 14-7983. Bethesda, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Institutes of Health, National Cancer Institute; 2014.
4. Zaridze DG, Blettner M, Trapeznikov NN, et al. Survey of a population with a high incidence of oral and oesophageal cancer. *Int J Cancer*. 1985; 36:153–158. [PubMed: 3160670]
5. Evstifeeva TV, Zaridze DG. Nass use, cigarette smoking, alcohol consumption and risk of oral and oesophageal precancer. *Eur J Cancer B Oral Oncol*. 1992; 28B:29–35. [PubMed: 1422467]
6. Stepanov I, Jensen J, Hatsukami D, et al. New and traditional smokeless tobacco: comparison of toxicant and carcinogen levels. *Nicotine Tob Res*. 2008; 10:1773–1782. [PubMed: 19023828]
7. Tomar SL, Henningfield JE. Review of the evidence that pH is a determinant of nicotine dosage from oral use of smokeless tobacco. *Tob Control*. 1997; 6:219–225. [PubMed: 9396107]
8. Stanfill SB, Connolly GN, Zhang L, et al. Global surveillance of oral tobacco products: total nicotine, unionised nicotine and tobacco-specific *N*-nitrosamines. *Tob Control*. 2011; 20:e2.

What this paper adds

The information on the chemical composition of nasvai, a tobacco product widely used in Central Asian countries, is nearly non-existent. Our analyses show that there could be drastic differences in the levels of important toxicants and carcinogens across nasvai products prepared by different producers. There is an urgent need for comprehensive surveillance of harmful constituents in these products and the health risks associated with their use. Such surveillance will generate critical data to aid in consumer education, product use cessation, as well as in the development and implementation of relevant regulatory policies in Central Asian countries.

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Figure 1.

The two versions of nasvai analyzed in this study*

* **A**, bulk unlabeled product placed in a plastic bottle (Uzbekistan); **B**, manufactured pre-packaged product (Kyrgyzstan)

Table 1

Levels of toxic and carcinogenic constituents in two samples of nasvai.

| Constituent or measure [*] | Pre-packaged 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 | 1,189 ± 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 |

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