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Tobacco and other occupational exposures among hookah bar workers

Zaid Al-Faham, MD[1], **Ryan F. LeBouf, PhD**[2], and **Randall J. Nett, MD, MPH**[2]

[1]Department of Occupational and Environmental Medicine, West Virginia University, Morgantown, West Virginia

[2]Division of Respiratory Health, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, West Virginia

Hookah bar workers are exposed to hookah smoke during work. Few studies have been published regarding the health of hookah bar workers.[1,2] Hookah, also known as argileh, goza, hubble-bubble, narghile, shisha, and waterpipe, consists of a small bowl where tobacco is burned, and then the tobacco smoke travels through a water chamber and along a rubber hose (pipe) to a mouthpiece where it is inhaled by the smoker.[3] Hookah bars are social gathering sites where customers often share the same hookah. Both the release of smoke from the hookah and exhalation of smoke by the smoker contribute to contaminated air in the hookah bar. Hookah use is common with an estimated 22–40% of U.S. college students having reported using hookah in the past year.[3] At present, more than 40 U.S. states are known to have hookah bars.[4]

Hookah delivers tobacco smoke and addictive nicotine, and is associated with health effects similar to that of cigarettes, including oral, lung, stomach, and esophageal cancers; reduced lung function; and infertility.[3,5] In addition, Hookah often contains flavoring chemicals, resulting in a large number of available flavors, such as cherry, chocolate, and watermelon.[3,6] A unique feature of hookah smoking compared with cigarette smoking is the cultural habit of sharing the pipe while engaging in social events. Thus, a range of infectious disease conditions are associated with sharing the hookah mouthpiece, including tuberculosis, herpes, and hepatitis infections.[5] The social atmosphere of the hookah bar venues, colorful

Correspondence Randall J. Nett, MD, MPH, National Institute for Occupational Safety and Health, 1095 Willowdale Rd, MS-2800, Morgantown 26505-2888, WV. gge5@cdc.gov.

AUTHORS' CONTRIBUTIONS

ZAF participated in study design, literature review, manuscript preparation, and manuscript review. RL participated in manuscript preparation and manuscript review. RN participated in study design, literature review, manuscript preparation, and manuscript review.

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No ethics review or approval was obtained because this paper did not involve human subjects or animal research.

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presentation of hookah, and flavorings used in the tobacco, all contribute toward attracting customers to hookah bars.

The inclusion of hookah in tobacco control activities is not well-defined in all U.S. states.[7] For example, some states do not have a statewide prohibition of hookah smoking in public places, while other states do not clearly define tobacco products. Therefore, hookah might not be interpreted as a tobacco product and hookah bars might not be considered a retail tobacco business.

Multiple studies have demonstrated hazardous occupational exposures in hookah bars.[1,2,8–10] A study evaluating the indoor air quality in 17 Virginia waterpipe cafés showed high fine particulate matter $(PM)_{2.5}$ concentrations in all smoking rooms.[8] The mean $PM_{2.5}$ in a smoking room in one waterpipe café was nearly seven-times higher than the Environmental Protection Agency (EPA)-defined “hazardous” level for outdoor air. Further, the mean $PM_{2.5}$ concentration of non-smoking rooms in waterpipe cafés was 13.7 times higher than that of non-smoking venues, thereby resulting in high $PM_{2.5}$ even for waterpipe café employees working inside the non-smoking rooms. A separate study of seven Maryland waterpipe cafés demonstrated indoor air concentrations of $PM_{2.5}$ and carbon monoxide (CO) were substantially elevated, and exceeded both that of cigarette smoking bars and EPA air quality standards.[10] A cross-sectional study of 50 workers in restaurants serving waterpipes demonstrated that occupational exposure to waterpipe smoke was associated with chronic cough and CO exposure.[1] A recent study involving 10 workers from four hookah bars in New York City revealed the employees working in environments had $PM_{2.5}$ and CO concentrations comparable with exposure levels observed in hospitality venues before the introduction of widespread public cigarette smoking bans.[2] Additionally, these hookah bar workers had significantly elevated mean exhaled CO levels at post-shift (49.4 ppm) compared with pre-shift (8.3 ppm). Finally, a hookah bar worker developed severe CO poisoning after lighting 30–40 hookahs filled with flavored tobacco.[9] The process of lighting the hookah involved the workers holding a butane lighter next to the coal and inhaling through the hose to draw the flame across to light the coals. The worker was found to have a carboxyhemoglobin level of 33.8% and electrocardiogram changes consistent with cardiac ischemia.

The artificial flavorings used in hookah also have potentially important health effects for the hookah bar worker, and thus far remain unexplored. Diacetyl, an alpha-diketone, occurs naturally in tobacco, but can also be added to tobacco to provide a buttery sweet taste, and odor.[11] Occupational exposure to diacetyl in the microwave popcorn, flavoring, and coffee industries has been associated with the development of obliterative bronchiolitis, a rare, severe, and irreversible lung disease.[12] Following the recognition that diacetyl was associated with severe lung disease, another alpha-diketone, 2,3-pentanedione, was introduced as an alternative flavoring chemical. Similar to diacetyl, exposure to 2,3-pentanedione has been associated with airway epithelial damage in animal studies.[13] To our knowledge, no studies evaluating the potential occupational exposure of hookah bar workers to diacetyl or 2,3-pentanedione have been performed.

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Occupational exposure to secondhand smoke through hookah smoking, and possibly toxins such as diacetyl, 2,3-pentanedione, and other potentially harmful chemicals, is a health concern for hookah bar workers. Unfortunately, there is a dearth of published studies describing the health experiences of this emerging workforce. Further studies are warranted that characterize this emerging public health issue and the prevalence of respiratory morbidity in hookah bar workers. Hookah bar management, union representatives, or hookah bar employees can request the National Institute for Occupational Safety and Health (NIOSH) conduct a health hazard evaluation to evaluate their workplace for potential work-related health effects of secondary hookah smoke and for the possibility of implementing prevention measures (https://www.cdc.gov/niosh/hhe/).

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