Medical Research Archives

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European Society of Medicine

OPEN ACCESS

Published: December 31, 2022

Citation: Pierre de Oliveira E, Lins Medeiros Assunção G, et al., 2022. Hookah, an Emerging Form of Smoking, Systemic Effects and Harmful Effects of Its Use, Medical Research Archives, [online] 10(12). https://doi.org/10.18103/mra.v10i12.3393

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DOI
https://doi.org/10.18103/mra.v10i12.3393

ISSN: 2375-1924

REVIEW ARTICLE

Hookah, an Emerging Form of Smoking, Systemic Effects and Harmful Effects of Its Use

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ABSTRACT

Hookah originates from India and in the last years spread around the world. The culture and the mystique behind this device promoted the use among the young population. Despite the thought that is the new safe way to smoke tobacco, recent studies showed that it can be more harmful than the cigarette, becoming a public health problem. Hookah increases airway reactivity and inflammation, causing an inflammation in the respiratory and cardiovascular system. The inhaled smoke contains chemicals agents that are toxic to the lung. As known in the literature the inhaled substance can lead to an acute eosinophilic pneumonia with a pulmonary interstitial infiltrate on radiological image. The degree of pulmonary involvement is varied and may cause a serious condition, requiring hospital admission and intensive care support. The treatment consists of ceasing the hookah use and the use of systemic corticosteroids. One important damage to the health is the infection disease like the tuberculosis transmission, cause by sharing the devise. In the cardiovascular system, the alterations were increasing the cardiac frequency and blood pressure in addition to causing inflammation in the endothelium of the vessel. Long-term studies are needed to correlate the use of this device with the risk of developing cancer.

I) Introduction

The term hookah is derived from the word haqqa, which means "pot,jar" and "cavity, hollow". It is also known as shisha, hugga, arghile, hookah hubble, gozza, water pipe or boori. Popular belief, the use was originally devised to impart health benefits by physicians responsible for the care of Akbar the Great.[1] The hookah originates from the north India, more precisely from the regions of Rajasthan and Gujarat, which are close to the Pakistani border, in the XV century. In the XVI century its use spread to the Ottoman Empire, followed by Egypt and other regions on Mediterranean. [2,3]

The culture and the mystique behind this device soon spread to Iran where people started using hookahs to smoke Ajami, a flavorless but strong type of tobacco. The globalization process rapidly spread the hookah in the world, and this use were especially among youth[1]. In 2018, in United States, nearly 1 in every 13 (7.8%) high school students had used a hookah to smoke tobacco, and about 1 in every 8 (12.3%) young adults aged 19-30 years had used a hookah to smoke tobacco. [4]

A hookah device is composed of a bowl, a hollow metal pipe and a glass base (Figure 1). The bowl is filled with tobacco with flavours and covered with a performed sheet of aluminium. When inhaled through the hose, a suction force air past the coal, heating the tobacco underneath which in turn produces smoke. The smoke travels down the steam, passes though the water, and the new cooled smoke fill the base. From there, it is drawn through the hose and inhaled.

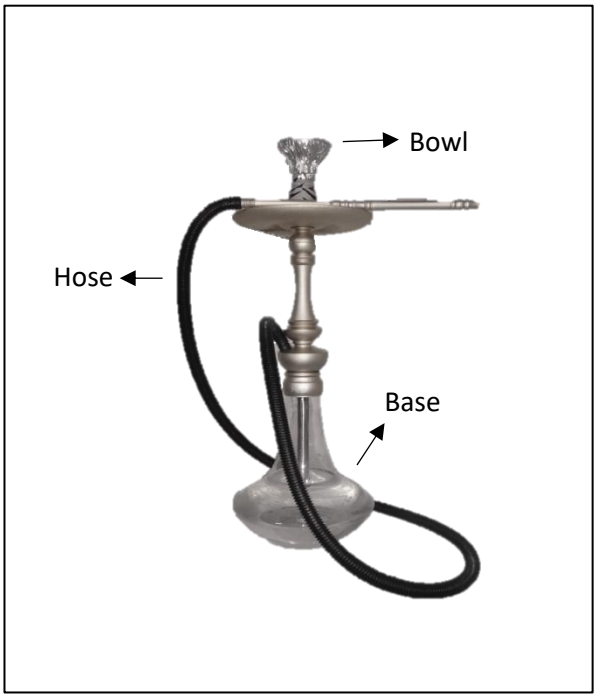

Figure 1: Representation of the hookah

The widespread use of this instrument is due to the lack of recognition of the potential adverse effects related to its use. Many people think that the base with water would serve as a filter for toxins. It is also believed that there is little to no nicotine or carbon monoxide content in hookah, and that some flavours could be beneficial for health. Users finds it safer than regular cigarettes. The most common perceived positive attributes of hookah smoking were the taste, the smell and the ability to relax and socialize with friends in cafes.[5]

The hookah is made up of 300 chemicals components and this number is potentially underestimated due to the low number of publications describing its chemical components.[6] Example of these chemical toxins are polyaromatic hydrocarbons (PAHs) , heterocyclic compounds, PAAs, N-heterocyclic amines, TSNAs, carbonylic compounds, VOCs, and miscellaneous organic and inorganic compounds.[6]

To compare the malefic effects of the use of hookah, the uptake of tobacco nicotine is equivalent to 2-12 cigarettes per portion of tobacco used, comparing the other harmful substance, a single 100 puff of hookah smoke session produces as much Tar as 20 or more than cigarettes, a single hookah smoking session yields 20 times amount of polycyclic aromatic

hydrocarbons (PAH) found in a main stream cigarette as well as formaldehyde acetaldehyde and acrolein.[7,8]

The greater absorption of these harmful substances is due to the mode of smoking including high frequency of puffs, deeper inhalations, and long duration of smoking sessions. The substances are aerolyzed, which contributes to their absorption by the pulmonary alveolus.[8]

The absorption of these chemical substances increases the risk of bronchitis, obstructive pulmonary disease, cardiovascular disease, lung cancer and other cancers like leukaemia. Due to user-to-user sharing of the mouthpiece, transmission of infectious diseases such as herpes and tuberculosis has been reported.[9,10]

Histopathology

Regarding the effects caused by hookah smoke, there is a lack of studies in the medical literature that describe its histopathological impact and fewer studies described the alteration in the respiratory system in animal model. Pilati and colleagues conduct an experimental study with 60 female Swiss mice, divides in six groups, one being the control group and the other five groups, the experimental group. The experimental group was exposed to conventional hookah smoke, and the survey data were collected after periods of 7, 15, 30, 60 and 90 days of exposure. The animals were exposed to 4 grams of tobacco for conventional hookahs, the duration of session was 30 minutes/day for each of the experimental groups. The lung microscopy of the exposure group to a hookah showed an increase in the thickness of the walls of the intra-alveolar ducts/septa, a reduction in the light of the alveoli, the formation of new cells, areas of ciliary loss in terminal bronchioles and the presence of inflammatory infiltrate with mononucleates cells (lymphocytes and mast cells) and other defence cells, and as the period of exposure of the animals to smoke was extended, a progressive exacerbation of the pulmonary change was noted.[10,11] According to this study daily exposure even for a short period of time can cause irreversible lung changes.

Angelo A and colleagues described a case of 20-year-old-man with a good health with symptoms of cough, fever and shortness breathing of one-month duration. He started smoking hookah with flavoured tabaco in the past couple of months. His Chest Computerized Tomography showed multiple, bilateral nodules of various size with basilar predominance without adenopathy. HIV and rheumatologic antibodies were negative. He was submitted to a lung biopsy; the histopathology reveals areas of centrally located suppurative inflammation, with a peripheral palisade of epithelioid histiocytes, lymphocytes, and multinucleated giant cells, forming loosely organized granulomas. Many vessels in the vicinity of the granulomatous process were infiltrated by lymphocytes and histiocytes. Necrosis was present focally in the vessels, but it was located partially within the necrosis of the granuloma. He was instructed to stop smoking hookah and was treated with prednisone (40mg/day) with clinical and radiographic improvement.[11]. Another similar case of a 19-year-old man who had regularly smoked tabaco through a "shisha" pipe for the preceding 3 months was submitted to a Chest Tomography-guided fine needle aspirate and a core biopsy. The histology reveals areas of preserved lung alveoli but prominent expansion of the lung interstitium with frequent necrotizing granulomas.[12]

Clinical features

The Hookah is being widely used by teenagers and young adults, therefore, the symptoms caused by the use of this device are prevalent in the young age group.[4] The hookah can cause a spectrum of symptoms and systemic complications.

Oral

Hookah or cigarette smoking, as well the others inhaled drugs and alcoholism abuse, can change the oral health, causing alterations on the lips, tongue, and oral cavity. Epidemiological studies show that the risk of developing oral carcinoma is up to nine times greater in smokers than in non-smokers.[13] Zamzuri and colleagues demonstrated that hookah smokers had poor oral hygiene and moderate inflammation of gingiva.[14] The occurrence of periodontitis was higher among hookah smokers and this may be related to impairment of the immune and inflammatory response, as observed in cigarette smokers. [15]

Hookah and the lungs

Due to the inhalations of toxic particles and gases from hookah, development of abnormal inflammatory response with a chronic obstructive pulmonary disease, acute eosinophilic pneumoniae or granulomatous lung disease.[1,16] The inflammatory response can cause fever, dyspnea, shortness of breath, non-productive cough and occasionally thoracic pain.[11,16,17]

A cross-sectional study was performed from January 2013 to December 2013, with 73 hookah smokers and 73 hookah non-smokers. Patients underwent pulmonary function test to assess the

ventilatory defect cause by the use of hookah. The hookah smoking group had a lower FEV_1 (3.80 ± 0.12 L in the hookah smoker group and 4.49 ± 0.073 in the hookah non-smoker group, p = 0.0001) and lower FEV_1/FVC (69.34 ± 1.87 %, in the hookah smokers group and 82.83 ± 1.29 % in the hookah non-smoker group, p = 0.0001).[18] Others studies confirmed the obstructive pattern on spirometry in hookah users.[19,20] This form of smoking has spread widely among adolescents and young adults, and as it is more harmful than the usual cigarettes we may have an increase in secondary diseases causes by tobacco use, like chronic obstructive disease and lung cancer in the future. In addition, as some groups mix marijuana with tobacco, we will also have an increase in dependence on illicit drugs and their comorbidities resulting from their use. [21,22]

Saad and colleagues when analysing spirometric changes, noticed that hookah use accelerated lung ageing, estimated lung age was higher than chronological age among hookah smoker (48 ± 18 years vs. 34 ± years, p <0.05).[19] As is well known, the lung matures by age 20 – 25 years, and thereafter aging is associated with a progressive decline in lung function. Irritants such as tobacco and the toxins contained in the hookah can impairment the lung maturation, affecting lung volumes and altering pulmonary flows.[23] The accelerated lung ageing associated to a decreased in lung function can be used as an argument to encourage smoking cessation.

The association between the use of cigarettes and malignancy has been well established, but the epidemiologic evidence for an association between hookah smoking and lung cancer is limited. A systematic review evaluated by Julian Little and colleagues, analyzed 52 studies in English language, this review found a significant positive association between hookah smoking and the risk of developing lung cancer, the pooled OR is 4.58 with 95% CI (2.61 to 8.03), with low heterogeneity, I2 =44.67%.[24] This finding was confirmed by Tasleem and colleagues, who conducted a case-control study in a tertiary referral center for cancer in India. The group showed that exclusive hookah smokers were about six times more likely to have associated lung cancer compared to non-smokers (OR 5.8, 95% IC, 3.9 to 8.6, p< 0.0001). They also showed that the frequency of changing the base water was not associated with any risk of lung cancer.[25] Although people think that the hookah is less harmful than the cigarette, this study showed that the water in the bases does not protect from the harmful effects of tobacco and toxic particles generated in the combustion that contain several toxic agents known to cause cancer and can generate risk of same cancer diseases as cigarette smokers. These include oral cancer, lung cancer, stomach cancer, esophageal cancer, bladder cancer.[4]

The exposure to aeroallergic particles can cause acute eosinophilic pneumoniae (AEP). AEP comprises a group of lung disease that share an eosinophilia as a common feature, for the diagnosis of AEP the patient must present at least one of this criteria: peripheral eosinophilia associated with pulmonary opacities on imaging tests; surgical or transbronchial biopsy findings of eosinophilia; and an increase in the proportion of eosinophils in bronchoalveolar lavage.[26] Due to changes in smoking habits, there was an increase in cases of AEP caused by the use of hookah. The main symptoms presented by the patient are dyspnea, dry cough, fever, thoracic pain, and myalgia. The high-resolution computed tomography of the chest showed ground glass opacities, pleural effusion, or small nodules. All cases had peripheral eosinophilia or an eosinophilic bronchoalveolar lavage. Most cases received outpatient treatment or in hospital war bed, rarely ICU and ECMO support.[27-29]

Community hookah use can cause the transmission of infection diseases including herpes simplex virus, Epstein–Barr, *Helicobacter pylori*, hepatitis B, various respiratory viruses, bacterial meningitis, periodontal conditions such as oral candida and tuberculosis. Most smokers do not routinely clean the hookah device, the warm , humid and nutrient-rich internal components can promote survival of pathogens outside of the host.[30]

Munckhof and colleagues evaluated a cluster of five cases of pulmonary tuberculosis identified through positive sputum culture. The cluster also included the contacts who were referred for further clinical assessment for tuberculosis and analyse the risk factor for tuberculosis infection. Sharing a marijuana hookah with a case of pulmonary tuberculosis was associated with transmission of tuberculosis (OR 2.22, 95% CI 0.96–5.17). Inhaling the same water and sharing the mouthpiece can be responsible for transmission.[31]

Fungal infections have also been reported as a hookah-transmitted disease, for example a 46-year-old patient with myeloid leukemia evaluated with hypoxemia and was diagnosed with invasive pulmonary aspergillosis. The culture of the water of hookah was positive for Aspergillus sp. Fungal infection is a rare case of infection pulmonary disease, and needs to be investigated manly in immunocompromised patients who use hookah. [32]

Cardiovascular complications

As cigarettes smoking, hookah smoking leads to a transient increase in heart rate and systolic blood pressure, smoking tobacco via hookah for 15 to 30 minutes increases heart rate by 6 to 13 beats per minute, systolic blood pressure by 3 to 16 mmHg, and diastolic blood pressure by 2 to 14 mmHg. These changes can be explained by sympathomimetic effects of nicotine, which are mediated by β-adrenergic activation.[34]

Shafique and colleagues conducted a cross-sectional study in Punjab province Pakistan and showed that hookah smokers were three times more likely to have metabolic syndrome (OR 3.21, 95% CI 2.38–4.33) compared with non-smokers after adjustment for age, sex, and social class. Hookah smokers were significantly more likely to have hypertriglyceridemia (OR 1.63, 95% CI 1.25–2.10), hyperglycaemia (OR 1.82, 95% CI 1.37–2.41), hypertension (OR 1.95, 95% CI 1.51–2.51) and abdominal obesity (OR 1.93, 95% CI 1.52–2.45).[34]

Metabolic syndrome has been associated with cardiovascular disease, for example lifetime exposures exceeding 40 water pipe–years (2 water pipes per day for a total of 20 years or 1 water pipe for 40 years) are associated with a 3-fold increase in the odds of angiographically diagnosed coronary artery stenosis.[35] The increased risk of metabolic syndrome and cardiovascular disease may help reinforce the need for hookah smoking cessation.

Conclusion:

Hookah smoking has spread in the world, mainly in younger population. Although it is thought to be a less harmful form of smoking, the medical literature shows that hookah can be associated with an increase of chronic lung disease, e.g., chronic obstructive disease and lung cancer, and an increased risk of cardiovascular disease with high impact on public health. More studies are needed to study the longitudinal and future effects of hookah smoking and health outcomes.

Bibliography:

1. Patel MP, Khangoora VS, Marik PE. A Review of the Pulmonary and Health Impacts of Hookah Use. Ann Am Thorac Soc 2019;16:1215-9.
2. Blachman-Braun R, Del Mazo-Rodriguez RL, Lopez-Samano G, Buendia-Roldan I. Hookah, is it really harmless? Respir Med 2014;108:661-7.
3. Aljarrah K, Ababneh ZQ, Al-Delaimy WK. Perceptions of hookah smoking harmfulness: predictors and characteristics among current hookah users. Tob Induc Dis 2009;5:16.
4. Hookahs. https://www.cdc.gov/tobacco/data_statistics/fact_sheets/tobacco_industry/hookahs/index.htm. 2022 .
5. Smith-Simone S, Maziak W, Ward KD, Eissenberg T. Waterpipe tobacco smoking: knowledge, attitudes, beliefs, and behavior in two U.S. samples. Nicotine Tob Res 2008;10:393-8.
6. Shihadeh A, Schubert J, Klaiany J, El Sabban M, Luch A, Saliba NA. Toxicant content, physical properties and biological activity of waterpipe tobacco smoke and its tobacco-free alternatives. Tob Control 2015;24 Suppl 1:i22-i30.
7. Pankow JF. A consideration of the role of gas/particle partitioning in the deposition of nicotine and other tobacco smoke compounds in the respiratory tract. Chem Res Toxicol 2001;14:1465-81.
8. Sepetdjian E, Shihadeh A, Saliba NA. Measurement of 16 polycyclic aromatic hydrocarbons in narghile waterpipe tobacco smoke. Food Chem Toxicol 2008;46:1582-90.
9. Marchetti AU, Boss OL, Schenker CM, Kalin K. Water-pipe Smoking as a Risk Factor for Transmitting Mycobacterium tuberculosis. Eur J Case Rep Intern Med 2020;7:001342.
10. Akl EA, Gaddam S, Gunukula SK, Honeine R, Jaoude PA, Irani J. The effects of waterpipe tobacco smoking on health outcomes: a systematic review. Int J Epidemiol 2010;39:834-57.
11. Pilati SM, Demarchi C, Souza M, Souza LS, Galli FL. Lung histopathological changes in Swiss mice exposed to narghile smoke. J Bras Patol Med Lab 2022.
12. De Dios JAA, Javaid AA, Mesologites T, Lahiri B. A 20-year-old man with fever, chest pain, and lung nodules. Chest 2011;140:1378-81.
13. Choe EH, Sutherland L, Hills C, Sood JD. Shisha smoking as a possible cause of bilateral granulomatous lung lesions. Respirol Case Rep 2018;6:e00374.
14. Hadzic S, Gojkov-Vukelic M, Pasic E, Jahic IM, Muharemovic A, Huseinbegovic-Cengic A. The Effects of Smoking "The Hookah" on the Oral Health of Fourth, Fifth and Sixth-year Students of the Faculty of Dentistry in Sarajevo. Mater Sociomed 2020;32:212-7.
15. Priyadarshini Hesarghatta Ramamurthy BAF, Anand S. Tegginamani, Avita Rath, Preena Sidhu2 and Ahmad Termizi Bin Zamzuri. Clinical and cytological findings in oral cavity of young shisha smokers and non-smokers – a comparative study. J Oral Med Oral Surg 2022;Volume 28.
16. Bibars AR, Obeidat SR, Khader Y, Mahasneh AM, Khabour OF. The Effect of Waterpipe Smoking on Periodontal Health. Oral Health Prev Dent 2015;13:253-9.
17. Mager S, Struss M, Wollsching-Strobel M, Karagiannidis C. [Acute Eosinophilic Pneumonia (AEP) after Hookah Smoking]. Pneumologie 2020;74:230-3.
18. Hassan A. Hookah smoking as presumed cause of idiopathic acute eosinophilic pneumonia. Chest Annual Meeting 2019.
19. Meo SA, AlShehri KA, AlHarbi BB, et al. Effect of shisha (waterpipe) smoking on lung functions and fractional exhaled nitric oxide (FeNO) among Saudi young adult shisha smokers. Int J Environ Res Public Health 2014;11:9638-48.
20. Ben Saad H, Khemis M, Bougmiza I, et al. Spirometric profile of narghile smokers. Rev Mal Respir 2011;28:e39-51.
21. Raad D, Gaddam S, Schunemann HJ, et al. Effects of water-pipe smoking on lung function: a systematic review and meta-analysis. Chest 2011;139:764-74.
22. Toquet S, Cousson J, Choiselle N, et al. Alveolar hemorrhage due to marijuana smoking using water pipe made with plastic bottle: case report and narrative review of the literature. Inhal Toxicol 2021;33:168-76.
23. Tashkin DP. Effects of marijuana smoking on the lung. Ann Am Thorac Soc 2013;10:239-47.
24. Sharma G, Goodwin J. Effect of aging on respiratory system physiology and immunology. Clin Interv Aging 2006;1:253-60.
25. Montazeri Z, Nyiraneza C, El-Katerji H, Little J. Waterpipe smoking and cancer: systematic review and meta-analysis. Tob Control 2017;26:92-7.
26. Koul PA, Hajni MR, Sheikh MA, et al. Hookah smoking and lung cancer in the Kashmir valley of the Indian subcontinent. Asian Pac J Cancer Prev 2011;12:519-24.
27. Dias OM, Nascimento E, Chate RC, Kairalla RA, Baldi BG. Eosinophilic pneumonia: remember topical drugs as a potential etiology. J Bras Pneumol 2018;44:522-4.
28. Ali Nihat Annakkaya EGIB, Özlem Öztürk , Binnur Önal , Fuat Aytekin , Öner Balbay. Waterpipe (narghile, hookah) tobacco

smoking-induced acute eosinophilic pneumonia. Eurasian Journal of Pulmonology 2018

29. Chaaban T. Acute eosinophilic pneumonia associated with non-cigarette smoking products: a systematic review. Adv Respir Med 2020;88:142-6.

30. Ali M SZ, Laktineh A, and Huda N. Acute eosinophilic pneumonia in a hookah smoker. Am J Respir Crit Care Med 2017.

31. Sinclair RG, Somsamouth K, Sahar D, Englert R, Singh P. Microbial contamination in the communal-use Lao tobacco waterpipe. Int Health 2021;13:344-9.

32. Munckhof WJ, Konstantinos A, Wamsley M, Mortlock M, Gilpin C. A cluster of tuberculosis associated with use of a marijuana water pipe. Int J Tuberc Lung Dis 2003;7:860-5.

33. Szyper-Kravitz M, Lang R, Manor Y, Lahav M. Early invasive pulmonary aspergillosis in a leukemia patient linked to aspergillus contaminated marijuana smoking. Leuk Lymphoma 2001;42:1433-7.

34. Azar RR, Frangieh AH, Mroue J, et al. Acute effects of waterpipe smoking on blood pressure and heart rate: a real-life trial. Inhal Toxicol 2016;28:339-42.

35. Shafique K, Mirza SS, Mughal MK, et al. Water-pipe smoking and metabolic syndrome: a population-based study. PLoS One 2012;7:e39734.

36. Sibai AM, Tohme RA, Almedawar MM, et al. Lifetime cumulative exposure to waterpipe smoking is associated with coronary artery disease. Atherosclerosis 2014;234:454-60.