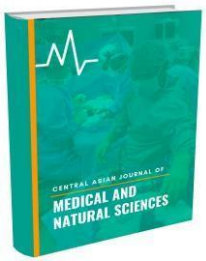

CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES
https://cajmns.centralasianstudies.org/index.php/CAJMNS
Volume: 06 Issue: 01 | January 2025 ISSN: 2660-4159

Article

The Hookah Smoking Increase The Infection of Many Pathogenic Bacteria

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Abstract: Hookah smoking, commonly known as shisha, water pipe, or arghile, has gained global popularity, particularly among younger populations. Despite its social appeal and perceived safety, hookah smoking exposes users to a complex mixture of harmful substances including nicotine, carbon monoxide, aldehydes, and heavy metals. These toxicants not only damage the respiratory tract but also create favorable conditions for microbial colonization and infection. This narrative review summarizes findings from various studies highlighting the link between hookah smoking and increased risk of bacterial, viral, and fungal infections. Tobacco smoke has been shown to alter the host's immune responses, promote pathogenic bacterial growth in the oral and respiratory tracts, and contribute to the development of antibiotic resistance. Additionally, case reports have demonstrated histopathological changes in the lungs associated with hookah use, characterized by granulomatous inflammation and vascular involvement. Shared use of hookah devices further elevates the risk of disease transmission, including respiratory viruses like COVID-19. The microbial contamination of hookah apparatuses, coupled with poor ventilation in social settings, amplifies the potential for infectious outbreaks. Furthermore, hookah smoking has been implicated in the proliferation of opportunistic fungal infections, particularly in immunocompromised individuals. The findings highlight the urgent need for public health interventions, increased awareness, and further research into the infectious risks posed by hookah smoking.

Keywords: Hookah smoking, Infectious diseases, Microbial contamination

Citation: Al-Hifli, K. H., Altayar, M. A., Al-Rwaziq, A. H. The Hookah Smoking Increase The Infection of Many Pathogenic Bacteria. Central Asian Journal of Medical and Natural Science 2025, 6(1), 434-440.

Received: 6th Dec 2024
Revised: 13th Dec 2024
Accepted: 20th Dec 2024
Published: 31th Dec 2024

1. Introduction

The phrase hookah is derived from the Arabic haqqa, which meaning pot, jar, cavity, or hollow. It is also referred to as shisha, hugga, arghile, hookah hubble, gozza, water pipe, and boori. According to popular belief, doctors who treated Akbar the Great initially developed the usage to provide health advantages. [1].

A hookah is made out of a bowle, a hollow metal in pipe, and a glass bottom (see Figure 1). A completed metal sheet is placed over the tobacco bowl, which is loaded with flavors. A suction force pushes air past the coal as it is breathed via the hose, heating the tobacco beneath and creating smoking . The smoke travels down of the steam, base though the water, and the new cooled smoke fill the base. It is then breathed after being pulled via the hose.

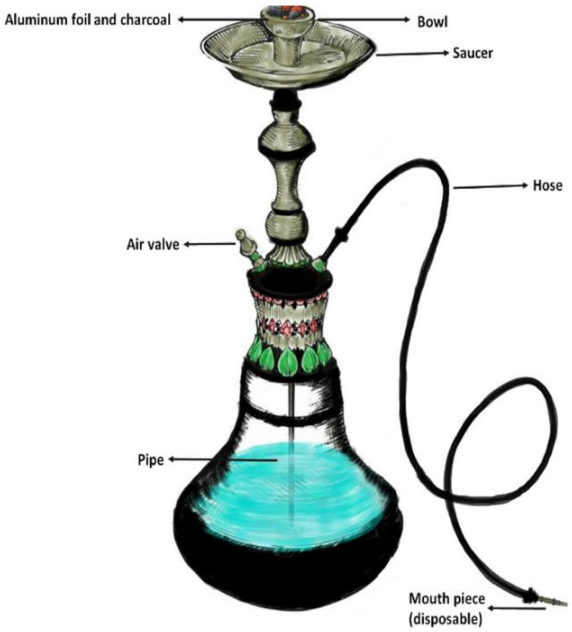

Figure 1. Hookah representation.

Nicotine, carbon with monoxide ,the aldehydes, hydrogen H cyanide, nickel, vanadium, and carbon monoxide are among the more than 7000 chemicals found in tobacco smoke, 250 of which are harmful or carcinogenic. The substances linked to smoking cause harm to the body's organs, particularly the lungs, which creates an environment that is conducive to the formation of microbiological infections [2].

Cigarette smoke's complex and detrimental properties change the structure of host-microorganism exchanges through all anatomical levels in the respiratory system, frequently leading to illness. Furthermore, long-term exposure to secondhand smoking can harm the host and result in lung cancer and other chronic respiratory conditions such chronic obstructive pulmanary desease(COPD) [3].

In addition to encouraging oral-respiratory tract bacteria infection, smoking can result in antibiotic resistance. Furthermore, alterations in the body's microbial ecology have been linked to cigarette smoke exposure [4]. In conclusion, smoking is linked to a number of modifications in the way the humoral and cellular immune systems operate. These alterations include lower circulating immunoglobulin levels, lower antibody responses to certain antigens, lower phagocyte activity, higher CD4 + lymphocyte counts, lower pro-inflammatory cytokine production, and lower CD8 + lymphocyte counts [5]. It's unclear how smoking affects the immune system. According to some experts, cigarettes contain antigens that can cause antigen-antibody complexes to develop. The humoral in nature and cellular immune systems' reactions may alter as a result of these complexes in the lungs and surroundings [6]. Numerous bacterial species, including anaerobic periodontal pathogens including P. gingivalis, Tannerella forsythia, SPP intermeda, Eikenella corrodens, Campylobacter rectus, Aggregatibacter actino- mycitemcometans, Treponeema dentecola, and Fusobacterium nuclaetum, have been found in the human oral cavity [7]. It has been demonstrated that smoking cigarettes changes the frequency of these pathogens in the oral cavity[8]. In this study, we examined how smoking a hookah raises the chance of contracting infectious illnesses as well as the potential pathways by which this risk may be elevated.

2. Materials and Methods

This study was conducted using a narrative review approach, collecting and analyzing information from previously published articles, case studies, and reports related to the health impacts of hookah smoking. Relevant literature was sourced from peer-

reviewed journals, health organization reports, and clinical case publications focusing on infectious diseases, histopathological findings, and microbial contamination associated with hookah usage. Emphasis was placed on studies investigating bacterial, viral, and fungal infections, as well as antibiotic resistance linked to tobacco consumption. The data were synthesized to highlight the biological mechanisms, microbial pathways, and potential health risks associated with hookah smoking.

3. Results and Discussion

Infectious Diseases Raleted to hookah Smoking:

According to global projections from 2017, infectious of respiratory illnesses among people aged 35 to 74 years caused over 490 m. incident cases and 1.34 m. fatalities. About 300,000 fatalities, or 22.5% of them, were linked to smoking [9]. Smoking raises the risk of a number of illnesses through a dose-dependent mechanism and is linked to infectious diseases that increase prevalence and death. Poorly reversible airflow restriction is the hallmark of COPD, which is also linked to fibrosis, emphysema, excessive mucus production, and opportunistic microorganisms' ongoing colonization of the lower airways [10], [11].

Histopathology

Few research have been conducted in the medical literature to characterize the histological consequences of hookah smoke, and even fewer have examined the changes in the respiratory system in animal models. A case involving a healthy 20-year-old male who had coughing, fever, and shortness of breath for a month was reported by Angelo A. and colleagues. In recent months, he began smoking hookah with flavor-infused tabaco. Multiple, symmetric nodules of varying sizes with basilar dominance and no adenopathy were visible on his chest CT scan. Rheumatologic and HIV antibodies were not found. He underwent a lung biopsy, and the histology shows patches of suppurative activity in the center, surrounded by a peripheral fence of lymphocytes, epithelioid of histiocyts, and giant of multinucleated cells that form loosely structured granulomas. Histiocytes and neutrophils invaded several arteries around the granulomatous process. There was localized necrosis in the arteries, however it was partly contained inside the granuloma's necrosis. He received treatment with prednisone (40 mg/day) and was told to quit smoking hookah; his radiography and clinical condition improved [12]. In a related example, a 19-year-old guy who had been smoking tabaco through a "shisha" pipe on a regular basis for the previous three months underwent a core biopsy and a tiny needle aspiration guided by chest thorax. Areas of lung alveoli that have been preserved are visible in the histology, but there is also a noticeable growth of interstitium of the lungs and a lot of necrotizing granulomas [13].

Hookah Smoking Associated Microorganisms

Bacterial spores, spores of fungal, components of cell wall (such as certain glucans and flagella), and various bacterial and fungal poisons are examples of microorganisms associated with tobacco. Throughout the production process, tobacco is linked to these microbiological species. According to several research, processed tobacco from different cigarette brands contains a wide variety of possible pathogens, including Serratia, Acinetobacter, Burkholderia, Bacillus, Clostridium, Staphylococcus, and Pseudomonas species, in addition to Mycobacterium avium, and 15 additional groups of bacteria [14].

Hookah Smoking and Viral Infactions

Dangerous chemicals included in hookah smoking damage the lungs, impair the respiratory system, and increase the body's susceptibility to bacterial infections, fungi, viruses, TB, and other illnesses, such as COVID-19 [15]. Apart from the potential for COVID-19 transmission, smoking hookah has a number of immediate and long-term consequences, beginning with the body's natural response to smoking, which includes coughing, thirst, and lightheadedness [16]. According to the World Health Organization,

because hookahs have less nicotine, people may smoke more and not know when to quit, which can result in nausea or upset stomachs [17]. Most hookah smokers think that the water at the bottom of the hookah bowl filters the smoke of hookah tobacco, removing many toxins and other dangerous chemicals, making it less detrimental to health [18]. As a result of hookah smoke entering the respiratory system, viruses in the chest can spread to the hookah pipe and then to the user. The mouthpiece and handle of the hookah apparatus, in particular, are colonized by microbes. The air quality at hookah cafés across the world is known to be bad due to congestion and inadequate ventilation, which results in high levels of particles, tobacco-specific nitrosamines, and polycyclic aromatic hydrocarbons. The most crucial step is social distance and public education on the potential connection between smoking (cigarettes, hookah, or roll-your-own) and the possibility of COVID-19 transmission. Alongside the efforts to stop the spread of COVID-19, smoking cessation initiatives should also be launched during this time. at Saudi Arabia, smoking a hookah is a common habit and a popular social pastime at cafés and everyday social events [19]. In Saudi Arabia, it is highly common for people to use hookah pipes with others [20,21], which increases the risk of COVID-19 transmission. This danger is increased by improper cleaning of hookah utensils, particularly trumpets. The risk of transmission can be decreased by non-participation, the use of sterile and clean equipment, adherence to hygiene practices, and COVID-19 preventative measures.

Hookah Smoking and Fungal Infections

Smoking and the prevalence of Candida albicans infection have been linked in several studies. By inhibiting host immunity and the anti-oxidative response, hookah smoke exposure might contribute to the pathophysiology of oral disorders such Candida albicans diseases [22]. In addition to being an established risk factor for oral candidiasis, smoking, either by itself or in conjunction with other variables, increases the chance of developing invasive fungal infections, such as those caused by Aspergillus species and Cryptococcus neoformans [23]. HIV infection, primary immunological weaknesses, chronic renal illness, neutropenia diseases , diabetes mellitus diseases, severe burns, influenza infection, and cortecosteroid medication are the main risk factors for invasive fungal infections. These individuals ought to use smoking cessation techniques [23]. In the case of cryptococcosis, smoking is strongly linked to infection with Cryptococcus gattii and C. neoformans in those who smoke with HIV and at-risk persons [24]. It was been considered, until that recently fungus don't cause deadly diseases in humans, and cause disease largely superficial epidermal diseases or infections heal fast, in most cases. On the surface of pathology, it has recently come to light that certain fungi may cause illnesses of the heart, brain, eye, and lungs, particularly in those with compromised immune systems. Workers and certain workers are exposed to lung conditions brought on by Aspergillus sp. infections in poultry farms. This form of fungus, which is quite common in Shisa, produces enormous volumes of conidia that spread through the air on farms. Inhaling this infected air can lead to catastrophic lung infections such Aspergillosis [25].

Hookah Smoking and bacterial Infections

Streptococci are the primary early colonizers in the biofilm that covers the mouth and play a crucial part in the development of oral illnesses, according to research on the oral microbial flora [26]. Streptococcus (S.) mutans is the primary cause of tooth decay, according to research on the subgingival microbiological evaluation; S. sanguis also contributes to oral plaque [27]. Smokers are also more likely to get respiratory infections, maybe as a result of creating an environment that encourages bacterial colonization [28]. particularly in sterile areas like the trachea, where there is changed inflammation and epithelial secretion [29]. Studies have examined how smoking affects the growth of S. mutans and sanguis, two bacteria that play a crucial role in oral disorders and raise the risk of periodontal diseases [30].

Bacterial infections are most likely to occur in those who smoke actively or are around secondhand smoke. Pneumonia, nasal cavity and respiratory system infections, fibrosis of cystic, bacterial meningitis, Legioonaires' infections , bronchitis, the spread of tuber otitis media, post-surgical and nosocomial infections, and Helicobacter pylori disease are among the bacterial infections linked to tobacco use [31]. One of the primary causes of pneumonia with pneumococcal infection, particularly in those with COPD, is smoking. Mucosal tissue is weakened by pneumonia via the ethanolic process. According to studies, cigarette smoke inhibits the alveolar macrophages' ability to phagocytose, which is a modulatory impact of complementary pneumonia. However, the excretion of macrospheres coated with IgG or non-opsonizing microorganisms remains unchanged. The body becomes less effective in warding off respiratory bacteria as a result.

There is strong evidence from several research that smoking is closely related to a number of respiratory diseases. CAP is caused by a number of infections, including M. pneumoniae, C. pneumoniae, S. pneumoniae, and numerous other respiratory viruses. Compared to non-smokers, older adults who smoke have a 2.3–3.1 times higher chance of developing CAP. The risk of acquiring CAP among ex-smokers is comparable to that of non-smokers five years after they stop smoking. Two-year-olds who see parental smoking are more susceptible to bacterial diseases, including otitis media, also known as meningococcal meningitis that and lower respiratory tract infections, particularly pneumonia brought on by S. pneumoniae [32]. According to a cohort study, children under five with smoking parents had a 2.5-fold increased risk of pneumonia and a 2.3-fold increased risk of other serious illnesses [33]. One of the main contributing factors to gastric cancer and gastroduodenal ulcer disease is Helicobacter pylori. Smoking is strongly linked to a higher risk of H. pylori infection and a worse effectiveness of treatment. Smoking has a significant impact on this illness, which makes sense given that a protracted infection raises the risk of gastric cancer [34].

Hookah Smoking and Antibiotic Resistance

Millions of people's health is being negatively impacted by antibiotic resistance, which is also costing the economy billions of dollars. This public health emergency can be greatly impacted by potential variables that influence the prescribing of antibiotics, among them tobacco usage [35]. According to certain research, antibiotic treatments for smokers have low efficacy. Smoking-induced biofilm development neutralizes the interactions with antibiotics and host defense in addition to limiting drugs' ability to reach bacteria [35, 36]. Smokers are significantly more likely than nonsmokers to have opportunistic infections such H. influenzae, S. pyogenes, S. pneumoniae, and M. catarrhalis [31]. The upper lungs suffers greatly from cigarette smoke. Smokers had a 20% to 30% higher chance of obtaining antibiotics than non-smokers among patients with an infectious illness. hookah smoke is one of the reasons that causes gingivitis and increases the colonization of bacteria in the sub-gingival region. Antimicrobial susceptibility in the population may rise as a result of tobacco usage being linked to increased antibiotic use [36].

4. Conclusion

Worldwide, hookah smoking has become more popular, especially among younger people. Despite being regarded as a less dangerous smoking habit, medical research indicates that hookah use may be linked to a higher risk of cardiovascular disease, which has a significant influence on public health, as well as chronic lung diseases like lung cancer and chronic obstructive pulmonary disease. The long-term and long-term impacts of hookah smoking on health outcomes require further research.

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