

Review

A Review of Trends, Health Implications, Regulatory Responses, and Socio-Cultural Factors of Hookah Smoking Among Young Adults in the United States

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Abstract

Hookah smoking has become a persistent social phenomenon among young adults in the United States, despite decades of tobacco control efforts. Moreover, hookah smoking presents unique public health challenges due to its strong social appeal, cultural relevance, and widespread use in urban centers and college communities. This paper provides a broad review of recent trends, health implications, regulatory responses, and sociocultural factors influencing hookah smoking. A narrative literature review was conducted using peer-reviewed articles and grey literature sources published between 2019–2025. Electronic databases included PubMed, CINAHL, and Google Scholar, along with reports from professional organizations and government agencies including CDC, FDA, WHO, and health department agencies, to review current public health recommendations and practice guidelines. Review materials were selected that focus on prevalence, health implications, and regulations of hookah smoking. Findings were synthesized to identify key applications, challenges and concerns, and future directions. This review provided a rapid and broad review of the current trends, health implications, regulatory responses, and sociocultural factors of hookah smoking among young adults in the United States. Interdisciplinary research and policy innovation are necessary to address the ongoing public health burden of hookah smoking among young adults in the United States.

Keywords: hookah smoking; waterpipe; health implications



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1. Introduction

Hookah smoking, also known as shisha, narghile, or waterpipe smoking, has experienced a marked and sustained rise in popularity across Western societies, particularly among adolescents and young adults [1,2]. Originally embedded in the cultural traditions of Middle Eastern, South Asian, and North African communities, hookah use has undergone a notable transformation in the United States, emerging as a widely accepted and fashionable social activity [3]. It is now prominently featured in urban nightlife, college settings, and digital platforms like Instagram, where curated images and videos often depict hookah use as a stylish, relaxing, and communal experience [4,5].

This social rebranding of hookah has played a critical role in shaping the perceptions of young users. Flavored tobacco products and the communal nature of hookah use continue to shape young adults' perceptions of reduced harm, despite evidence demonstrating

substantial toxicant exposure [3,6]. It is crucial to investigate whether these reasons continue to be the main factors in modern hookah usage.

Hookah smoking in the United States also frequently occurs in specialized establishments such as hookah lounges and cafés, where staff prepare the device, manage charcoal, and maintain the apparatus throughout the session. These venues create structured social environments that reinforce cultural norms and facilitate prolonged smoking sessions. Studies show that hookah lounges are often located near college campuses and expose patrons to high levels of particulate matter and toxicants, contributing to increased experimentation and regular use among young adults [7,8]. In recent years, these lounges have reduced in numbers. A more updated report is needed on how the consumers use hookah and whether these venues are still relevant.

Research has indicated that a single hookah session may expose users to more smoke over a longer period than smoking a cigarette, resulting in greater cumulative exposure to toxicants such as carbon monoxide, tar, heavy metals, and carcinogenic polycyclic aromatic hydrocarbons [9,10]. In addition, the use of charcoal to heat tobacco further increases exposure to harmful chemicals not typically present in cigarette smoke [11]. Furthermore, secondhand smoke from hookah—which consists of smoke exhaled by users as well as smoke produced by the burning charcoal and heated tobacco—poses a serious health risk to non-users, particularly in poorly ventilated indoor environments such as hookah lounges [12–14]. This exposure includes thousands of harmful chemicals, such as toxicants, carcinogens, and respiratory irritants [14]. As new evidence emerges, it is important to periodically synthesize new literature to identify how these mechanisms are impacting consumers' experience and health of those exposed to this smoke.

As smoke travels from the heated tobacco through the stem and into the water chamber, heat transfer occurs between the hot smoke and the cooler water, reducing the temperature of the inhaled aerosol. Water filtration removes little to none of the toxicants present in hookah smoke, including nicotine, heavy metals, and volatile organic compounds [15]. Although the cooled aerosol feels smoother, this sensory experience does not reflect reduced toxicant exposure. Tobacco companies continuously evolve their product to attract consumers and to comply with tobacco policies. Identification of these changes and their impact on specific disease mechanisms can help in education of health care providers and hookah users.

These misperceptions are further reinforced by the lack of strong regulatory oversight and minimal warning labels, especially in hookah lounges and retail settings [3,14,16]. Although the Family Smoking Prevention and Tobacco Control Act granted the U. S. Food and Drug Administration authority of tobacco products, the regulation of hookah tobacco has remained inconsistent. Loopholes in flavor bans [17,18], limited enforcement in commercial establishments [18], and the absence of targeted public awareness campaigns as well as warning labels on packaging all contribute to the continued appeal and accessibility of hookah.

Moreover, substantial variation in local and state policies leads to significant disparities in regulation, marketing, and taxation of hookah products [18,19]. Hookah use in the United States varies significantly by age and gender, with younger adults and males exhibiting the highest prevalence. According to the Centers for Disease Control (CDC), hookah use is most common among individuals aged 19–30, particularly in urban areas, where nearly 1 in 5 young adults reported past-year use in 2018. More recent trends show a decline in youth usage, with the number of middle and high school students reporting current hookah use dropping from approximately 290,000 in 2023 to 190,000 in 2024—a 34% reduction. Among adults, those aged 25–44 consistently report the highest rates of both current and lifetime use. Gender disparities are also evident: males are significantly more likely than females to

engage in hookah smoking across all age groups. These findings underscore the importance of targeted public health interventions focused on younger male populations to mitigate the health risks associated with hookah use [20]. As these trends evolve, it is important to identify vulnerable populations to get a more accurate update on where to direct public health efforts.

Despite this modest decline in prevalence, emerging evidence points to a troubling rise in the co-use of hookah with other substances, including alcohol, cannabis, and e-cigarettes, which may contribute to poly-tobacco dependence and exacerbate associated health risks [21,22]. These findings underscore the need for targeted public health interventions that address both demographic risk factors and patterns of concurrent substance use. A change in product regulation can lead to a change in trends. Therefore, it is crucial to continue synthesizing newly published literature on the use of these products.

Given these converging factors—continued use and poly-product use, persistent misperceptions, substantial health risks, and insufficient regulation—there is a pressing need for a more coordinated public health response. This paper seeks to critically examine the current multifaceted landscape of hookah use among young adults in the United States. Through a review of current literature, national health data, and policy frameworks, this study will explore the sociocultural, behavioral, and regulatory dimensions that sustain hookah smoking's popularity. Ultimately, this review argues for evidence-informed interventions, robust policy innovation, and culturally sensitive educational strategies to mitigate the growing public health burden associated with waterpipe tobacco smoking.

The hookah is designed to enable the inhalation of flavored tobacco smoke through a water filtration system. The main components of the hookah include the bowl (head), which holds the tobacco mixture (shisha) and it is typically made from clay, ceramic, or silicone; the tobacco (shisha) is a moist blend of shredded tobacco leaves mixed with sweeteners, glycerin, and flavorings [23]. Traditional variants like tombak and jurak are less common in Western countries.

Charcoal is placed on top of perforated foil or a metal screen covering the bowl to indirectly heat the tobacco. However, burning charcoal also releases additional harmful substances, including carbon monoxide, heavy metals, and carcinogens [24]. The stem and body of the hookah, usually made of metal, channel the smoke down into the water base (vase), which cools and humidifies it. Despite common belief, studies show that water filtration does not effectively remove toxicants such as nicotine, heavy metals, or volatile organic compounds [23]. Finally, the smoke is inhaled through a hose and mouthpiece, with modern hookahs often featuring multiple hoses, promoting group use and increasing the risk of infectious disease transmission [25].

Hookahs vary widely in design, size, and material—ranging from traditional, hand-crafted models to contemporary, mass-produced devices with LED lighting and glass components. Despite these variations, the fundamental function remains consistent: producing smooth, flavorful smoke that is inhaled over prolonged sessions, often lasting 45 min to an hour or more. The combination of aromatic flavors, perceived filtration, and the social nature of its use has made the hookah especially attractive to young adults. However, the complexity of the apparatus and its reliance on charcoal contribute to significant health risks.

While hookah use is more prevalent than smoking traditional cigarettes, relatively little is known about the trends related to this product and it is under-researched compared to cigarette smoking. This apparent gap in knowledge coincides with a rapidly evolving political, social, and socioeconomic landscape. A more updated literature review is necessary to investigate in further detail current gaps in the characteristics of modern hookah users, the impact of this product's use on its consumers, consumers' reasons for use of this

product, the nature of regulation and enforcement of this product, and effectiveness of this product in tobacco cessation. Therefore, the purpose of this paper is to provide a broad review of the recent trends, health implications, regulatory responses, and sociocultural factors influencing hookah use. This literature review will address the following specific objectives: (1) identify the change in trends in hookah use among young adults in the United States of America, (2) share new evidence on health impact related to hookah use, (3) outline the regulatory landscape related to hookah marketing, distribution, and use, and (4) identify the social and cultural implications of hookah use in the United States.

2. Materials and Methods

This study employed a narrative literature review approach to synthesize the current evidence related to hookah use among young adults in the United States. The narrative literature review methodology was selected to allow quick review and inclusion of diverse evidence sources, including peer-reviewed studies, public health reports, and national survey data, given the evolving nature of tobacco use trends and socio-environmental influences.

Three electronic databases were used to search relevant articles: CINAHL, PubMed, and Google Scholar. The initial search was conducted independently by an expert in hookah smoking and vaping. The search keywords included combination of “hookah smoking,” “waterpipe,” and “shisha.” Hand-searching and cross-referencing were also conducted to identify and include relevant literature. Grey literature was searched to review national survey data, current regulatory policies, and guidelines via websites, such as the CDC, FDA, WHO, and health department agencies.

Inclusion criteria included if the articles were published between 2019 to 2025, written in the English language, and conducted only in the United States. Articles were excluded if outcomes were not specifically reported or not directly relevant to hookah use.

The title and abstracts were reviewed for screening to examine relevance to the study purpose. Then, full-text articles and reports were reviewed, summarized, and synthesized. An Excel spreadsheet was used to summarize each article. From each article, the following data were extracted: author name, publication year, purpose, article type, study design, sample, sample size, study location, main outcomes, and summary of findings. The grey literature’s findings were analyzed and synthesized narratively. As this study was conducted as a narrative review rather than a systematic review, the formal PRISM-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) was not strictly applied; however, the PRISMA-ScR checklist was used to enhance the clarity of the review process and this reporting [26].

3. Results

3.1. Characteristics of Included Literature

This review included 15 articles published between 2019 and 2025 that examined trends, health implications, perceptions, behavioral patterns, and regulatory concerns related to hookah smoking among young adults in the United States. The literature consisted of nine original research studies, five review articles, and one editorial commentary. Study designs included cross-sectional surveys, longitudinal cohort studies, randomized crossover trials, secondary analyses of nationally representative datasets, systematic reviews, scoping reviews, and spatial analyses. Sample sizes ranged from small experimental studies involving 18 participants to large national cohort analyses including over 34,000 participants. Most studies focused on adolescents, college students, and young adults, with several emphasizing specific populations such as Middle Eastern communities, sexual minorities, and healthcare students. To improve conceptual clarity and synthesis,

the included studies were grouped into thematic categories based on their primary focus: (1) physiological and health effects, (2) psychosocial, perception-based, and sociocultural factors, and (3) behavioral patterns, epidemiology, and substance co-use.

3.1.1. Studies Focused on Physiological and Health Effects

Several studies examined the physiological consequences and health implications associated with hookah smoking, particularly cardiovascular, respiratory, toxicological, and inflammatory outcomes. Rezk-Hanna et al. (2023) demonstrated that nicotine-containing electronic hookah significantly impaired vascular endothelial function and increased heart rate and arterial blood pressure, suggesting substantial cardiovascular risks associated with e-hookah exposure [27]. Similarly, Masso-Silva et al. (2022) reported that electronic hookah may produce even greater cardiovascular and inflammatory effects than traditional hookah smoking [28].

Additional evidence from Qasim et al. (2019), Bhatnagar et al. (2019), and Patel et al. (2019) consistently showed that hookah smoke exposes users to elevated concentrations of nicotine, carbon monoxide, tar, polycyclic aromatic hydrocarbons, and heavy metals [29–31]. These toxicants were associated with endothelial dysfunction, platelet activation, oxidative stress, respiratory disease, chronic inflammation, and increased risks of oral, esophageal, and pulmonary cancers. Several studies further emphasized that the water filtration process does not effectively eliminate harmful toxicants, despite widespread public misconceptions regarding the relative safety of hookah smoking.

Toxicological and biomarker-focused evidence additionally highlighted substantial exposure risks among both direct users and individuals exposed to secondhand smoke in hookah lounges and social environments. Collectively, these studies indicate that both traditional and electronic hookah smoking contribute significantly to cardiovascular morbidity, respiratory complications, carcinogenic exposure, and broader public health risks.

3.1.2. Studies Focused on Psychosocial, Perception-Based, and Sociocultural Factors

A substantial portion of the literature explored psychosocial determinants, risk perceptions, social norms, and sociocultural influences associated with hookah smoking among young adults. Multiple studies identified perceived reduced harm, social acceptability, flavored tobacco products, stress relief, curiosity, and peer influence as primary factors driving initiation and continued use.

Kuk et al. (2022) found that adolescents and young adults who perceived hookah smoking as less harmful or less addictive were significantly more likely to initiate use at earlier ages [32]. Likewise, Soneji et al. (2021) reported that socialization, appealing flavors, and beliefs that hookah smoking is safer than cigarette smoking contributed strongly to persistent use behaviors among both youth and adults [33].

Jehi et al. (2025) identified several psychosocial and environmental determinants of hookah smoking, including sensation seeking, social acceptance, stress management, cultural identity, accessibility of hookah lounges, and weak enforcement of tobacco regulations [34]. Similarly, Kozachek et al. (2025) observed higher hookah smoking prevalence among Middle Eastern and Arab college women with elevated stress levels, stronger social engagement, and more liberal gender-role attitudes [35].

Jamil et al. (2020) additionally demonstrated that perceptions of tobacco-related risks differed across ethnic and demographic groups, with hookah smoking particularly prevalent among Middle Eastern populations, younger adults, and college students [36]. Collectively, these studies underscore the powerful influence of social identity, peer environments, cultural normalization, and inaccurate harm perceptions on hookah use behaviors among young adults.

3.1.3. Studies Focused on Behavioral Patterns, Epidemiology, and Substance Co-Use

Several studies focused on epidemiological trends, behavioral patterns, geographic accessibility, initiation trajectories, and concurrent substance use associated with hookah smoking. Findings consistently indicate that hookah use remains concentrated among adolescents, college students, and emerging adults, particularly within socially permissive environments.

Cooper et al. (2019) documented increasing rates of hookah use among adolescents and high school students, with higher prevalence observed among males, Hispanic populations, and individuals exposed to both high- and low-socioeconomic risk factors [1]. Pérez et al. (2021) further reported that hookah initiation peaked between ages 18 and 24, with significant increases occurring during the transition from adolescence to emerging adulthood [37].

Behavioral studies also highlighted substantial patterns of poly-tobacco and concurrent substance use. Sakthi et al. (2024) demonstrated elevated rates of co-use behaviors among sexual minority hookah smokers, while Ebrahimi Kalan et al. (2023) identified increasing marijuana consumption through hookah devices among U.S. adults [22,38]. These findings suggest expanding diversification of hookah-related substance use behaviors beyond traditional tobacco consumption.

Environmental accessibility additionally emerged as a significant contributor to hookah use patterns. Sun et al. (2022) found that hookah lounges and tobacco retailers clustered geographically near college campuses, increasing exposure and accessibility among young adults [7]. Together, these studies emphasize the importance of developmental, environmental, and behavioral influences in sustaining hookah use among young adult populations.

3.2. Overall Synthesis of Key Findings

Across the reviewed literature, hookah smoking emerged as a multifaceted public health concern shaped by physiological risks, psychosocial influences, sociocultural normalization, and evolving behavioral trends. Although some national surveillance data indicate modest declines in youth hookah use, young adults, particularly college students and socially vulnerable populations, continue to demonstrate substantial rates of experimentation, regular use, and poly-substance co-use. The literature consistently identified widespread misconceptions regarding the perceived safety of hookah smoking compared with conventional cigarette smoking, despite strong evidence linking hookah use to cardiovascular dysfunction, respiratory disease, carcinogenic exposure, and nicotine dependence. Social and environmental influences, including peer networks, flavored tobacco products, cultural identity, and the increasing accessibility of hookah lounges near college campuses, further contribute to continued use among young adults.

Emerging trends involving electronic hookah products and marijuana use through hookah devices additionally highlight the evolving complexity of hookah-related behaviors and the limitations of existing tobacco regulatory frameworks (see Table 1). Overall, the reviewed evidence underscores the urgent need for culturally sensitive public health interventions, stronger regulatory oversight, improved risk communication, and targeted prevention and cessation strategies aimed at reducing hookah-related harms among young adults in the United States.

Table 1. Characteristics of included studies organized by thematic category.

Author (Year)	Study Design	Sample (n) or Number of Studies	Study Location	Main Outcome	Main Findings Related to Hookah Smoking
Physiological and Health Effects					
Rezk-Hanna et al. (2023) [27]	Randomized crossover design	21 and 39 years of age (n = 18) [Mean age: 26 years old]	U.S.	Electronic hookah (e-hookah) and circulating factors	E-hookah vaping with nicotine significantly impairs vascular endothelial function, while vaping without nicotine does not cause this impairment. Increases in heart rate and mean arterial pressure were observed after e-hookah with nicotine vaping, but not significantly after e-hookah without nicotine or sham
Qasim et al. (2019) [29]	Literature Review	213 studies were cited	Texas, U.S.	Effects of hookah on health and cardiovascular system	Hookah smoking exposes users to elevated levels of toxicants such as carbon monoxide, nicotine, polycyclic aromatic hydrocarbons, and heavy metals compared to cigarettes, leading to comparable or greater risks of respiratory infections, lung diseases, oral/esophageal cancers, and a pro-inflammatory state. Cardiovascular effects include acute increases in heart rate, blood pressure, and platelet activation, as well as endothelial dysfunction and heightened thrombotic risk, potentially contributing to coronary artery disease and myocardial infarction.
Masso-Silva et al. (2022) [28]	Commentary (review)	Not reported (14 studies were cited)	Not reported	Effect of e- hookah	Commentary discusses research findings showing that e-hookah causes more harm than traditional hookah smoking, which found more profound cardiovascular effects, higher inflammation markers and equal nicotine delivery with e- hookah compared to traditional hookah.

Table 1. Cont.

Author (Year)	Study Design	Sample (n) or Number of Studies	Study Location	Main Outcome	Main Findings Related to Hookah Smoking
Bhatnagar et al. (2019) [30]	Scientific statement	Not reported	Worldwide & U.S.	Hookah smoking & cardiovascular risks	Water pipe smoking significantly increases cardiovascular disease risk through higher toxic exposures than cigarettes, causing immediate and long-term heart damage.
Patel et al. (2019) [31]	Narrative literature review	31 studies cited	Multiple cities, U.S.	Epidemiology of hookah	Hookah smoking contains high levels of nicotine, tar, carbon monoxide, polyaromatic hydrocarbons, and heavy metals It is not safer than cigarette smoking despite common misconceptions about water filtration. Increased risks of obstructive lung disease, lung cancer, and head/neck malignancies, with acute effects including elevated carboxyhemoglobin and carbon monoxide levels that surpass those from cigarette smoking.
Psychosocial, Perception-Based, and Sociocultural Factors					
Kuk et al. (2022) [32]	Secondary analysis of nationally representative cohort study (Waves 1–5 from PATH Study)	Youth never hookah use (n = 21,968, N = 40,343,800)	U.S. (nationwide)	Perceptions on hookah	Youth who perceive hookah as neither harmful nor addictive are significantly more likely to initiate hookah use at earlier ages compared to those who view it as both harmful and addictive. By age 18, one fourth of youth with low harm or addiction perception had initiated hookah use, highlighting the need for early education on its risks.

Table 1. Cont.

Author (Year)	Study Design	Sample (n) or Number of Studies	Study Location	Main Outcome	Main Findings Related to Hookah Smoking
Jehi et al. (2025) [34]	Scoping Review	124 studies for prevalence & 162 studies for determinants; studies had to include sample below the age of 25	Global including U.S. (multiple countries)	Prevalence and determinants of hookah smoking	Mostly prevalent geographical regions: Middle Eastern regions, South Asia, U.S., European countries Determinants: ages, gender, ethnicity, cigarette smoking, other substance use (e.g., alcohol, cigarette), knowledge, stress management, sensation seeking, hookah flavor, having friends and/or family members who smoke hookah, social acceptability, intention, positive attitude, low hookah refusal self-efficacy, curiosity, accessibility to cafes and hookah lounges, and lack of enforcement of prohibiting laws were positively associated with hookah smoking among youth
Kozachek et al. (2025) [35]	Cross-sectional design using an anonymous online survey	Middle Eastern Arab college women (n = 406) [Mean ages: 21 years old]	Northeastern region of the U.S.	Prevalence of cigarette smoking & hookah smoking	19% reported cigarette smoking and 21% reported hookah smoking. Revealed that hookah smoking was significantly higher among Arab college women who are full-time, single, or Muslim, belong to student organization or religious organizations, obtain their health information from the internet, acculturation-heritage, higher levels perceived stress, and more liberal-egalitarian attitudes toward women.

Table 1. Cont.

Author (Year)	Study Design	Sample (n) or Number of Studies	Study Location	Main Outcome	Main Findings Related to Hookah Smoking
Soneji et al. (2021) [33]	Secondary analysis of nationally representative cohort study (Waves 1–2 from PATH Study)	693 youth and 4400 adult past-year hookah smokers	U.S. (nationwide)	Reasons for hookah smoking cessation and transition	The study assessed transitions in frequency of hookah smoking and reasons for cessation and maintenance of high-frequency use among youth and adults using longitudinal data from the Population Assessment of Tobacco and Health (PATH) study. Socializing, appealing flavors and Perception that hookah is less harm than cigarette influence hookah usage.
Jamil et al. (2020) [36]	Cross-sectional survey study	671 Participants	Michigan, U.S.	Perception of risks of tobacco and hookah	Prevalence of tobacco was 38.9% among the population, with hookah-only smoking at the lowest rate of 8.8%, compared to 14.5% for cigarette-only and 15.6% for dual use. Hookah smoking was notably higher among Middle Eastern subgroups, particularly Chaldeans (12.9%) and Arabs (8.6%), versus 2.8% in non-Middle Eastern groups. Prevalence was elevated among students (16.9%), youth aged 18–24 (15%), those with high school education or higher (9.8%), US-born individuals (7.7%), singles (12.2%), those with incomes over \$20,000 (10.8%), regular exercisers (9.6%), and females (8.9%).

Table 1. Cont.

Author (Year)	Study Design	Sample (n) or Number of Studies	Study Location	Main Outcome	Main Findings Related to Hookah Smoking
Behavioral Patterns and Substance Co-Use					
Sakthi et al. (2024) [22]	Secondary analysis of nationally representative cohort study (Wave 4–5 from PATH Study)	920 Current hookah smokers; SM adults (n = 200) and heterosexual adults (n = 720)	U.S. (nationwide)	Concurrent use of substances among SM hookah smokers	Sexual minority adults have significantly higher rates of current hookah smoking compared to heterosexuals but show comparable rates of concurrent substance use when they smoke hookah.
Kalan et al. (2023) [38]	Secondary analysis of nationally representative cohort study (Wave 3–5 from PATH Study)	34,279 US adults (Wave 5)	U.S.	Prevalence of smoking marijuana from a hookah	An estimated 23.6 million U.S. adults (9.7%) reported ever smoking marijuana from a hookah device as of 2018–2019, with this practice showing a significant increasing trend from 8.9% in 2015–2016 to 9.7% in 2018–2019. Adults aged 25–44, with more than high school education, poor mental health, or White or LGBTQ+ were more likely to smoke marijuana from a hookah.
Pérez et al. (2021) [37]	Secondary analysis of nationality representative cohort study (Waves 1–4 from PATH Study)	Young adults never hookah users (n = 6631; 22,669,597)	U.S. (nationwide)	Estimate the age of initiation of hookah use	Hookah initiation peaks early at ages 18–24 with the largest increase at 5.8% for ever use and 2.7% for past 30-day use between ages 18 and 19. Cumulative incidences of 10.5% for ever use, 4.7% for past 30-day use, and 1.2% for regular use by age 21 was also recorded. Hispanic young adults were 59–182% more likely to initiate all three hookah use behaviors at earlier ages compared to non-Hispanic Whites, while non-Hispanic Blacks showed 102–167% higher likelihood for ever-use and past 30-day use initiation.

Table 1. Cont.

Author (Year)	Study Design	Sample (n) or Number of Studies	Study Location	Main Outcome	Main Findings Related to Hookah Smoking
Sun et al. (2022) [7]	Cross-sectional spatial analysis study	Not reported (spatial data for college campuses, hookah lounges, vape shops, and tobacco retailers)	California, U.S.	Spatial clustering of hookah access	Hookah lounges cluster significantly near both community colleges (from 0.4 miles) and 4-year colleges (from 0.2 miles) Vape shops cluster only near community colleges (from 0.1 mile) but not near 4-year colleges All tobacco retailers cluster near community colleges (from 0.5 miles) and 4-year colleges (from 1.3 miles)
Cooper et al. (2019) [1]	Systematic Review	55 peer-reviewed articles	US	Hookah use among adolescents	Rising rates of ever and current hookah use among US youth, particularly among older high school students, while prevalence remains stable and low among middle schoolers. Socioeconomic associations are mixed, with some high-SES indicators (e.g., parental education, disposable income) and low-SES proxies (e.g., no firm college plans, free/reduced lunch eligibility) both correlating with increased use of hookah Older age, male gender, and elevated rates in certain racial/ethnic groups like Hispanics, Asians, and non-Hispanic Whites are linked with hookah usage

Abbreviations: PATH Study: Population Assessment of Tobacco and Health Study; SM, sexual minority.

While most of the studies examined traditional hookah/waterpipe smoking, a few researched electronic hookah [28,39]. The examined substances are predominantly tobacco-based, except in one study on marijuana use through hookah [38], and most highlighted flavored products as the major impetus of hookah use. Traditional hookah (waterpipe) products were used in 12 studies [1,3,7,22,30–33,35–38], while electronic hookah (e-hookah) was used in three studies [28,29,39], with several studies comparing both. The ingredients analyzed were primarily tobacco-flavored with various flavorings (most often, fruit flavor). E-hookah ingredients commonly included propylene glycol, vegetable glycerin, and flavored chemicals, with or without nicotine. Research topic areas addressed health effects (namely cardiovascular consequences), usage patterns, co-use with other substances, geographic prevalence (including spatial concentration near college campuses), demographic variation by ethnicity and sexual orientation, perceptions of risk, and determinants of hookah initiation and maintenance.

3.3. Key Findings from Literature Synthesis

Hookah tobacco smoking has evolved from a culture-bound experience to a global public health issue and several concerning trends are observed in the United States among young adults [30,34]. Hookah tobacco smoking is increasing globally, and hookah smoking is more common among teenagers and young adults than among adults in the United States [1]. Hookah or waterpipe smoking, otherwise referred to by various cultural terms like narghile, shisha, argileh, and hubble-bubble, involves inhaling tobacco through a water-held chamber, creating a perception of filtered and therefore “safer” intake than cigarettes [29].

The current picture of young adults in the United States regarding hookah use reflects a complex epidemiologic profile, showing declining traditional use coupled with a resurgence in worrisome trends. While younger generations have shown declines in traditional use of hookahs, from 7.8% in 2018 to 2.7% in 2023, electronic hookahs (e-hookahs) and other electronic nicotine delivery systems are now available [28,39]. However, these declining teen rates differ from concerning lifetime exposure trends, with every use increasing from 16.39% to 20.92% over the same period according to PATH Study data from 2013–2021 [32,37].

Surveillance trends in the recent past identify clustered patterns of hookah use among youth populations. In 2024, 2.25 million middle and high school students reported current use of any tobacco product, and a significant decline was experienced in the past year in current hookah use (290,000 in 2023 compared to 190,000 in 2024) [1]. In adults, the prevalence of recent waterpipe use was 0.9%, most common among the 18–44 age group (1.5% for 18–24 years and 1.6% for 25–44 years) compared to older adults [30]. Young adults are the primary target group for initiation and use of hookah, and college environments are particularly high-risk settings [7]. Research consistently finds that hookah smoking appears particularly common among college students, and one review placed estimates at 20% of U.S. college students having used hookah in the last year [1]. The popularity within this population appears to be multifaceted, with studies indicating that past-month use of hookah was more common than past-month cigarette use (16% vs. 12%) in some college samples [35].

Emerging adulthood (18–25 years) provides a critical theoretical context in which to frame patterns of hookah use [37]. Emerging adults (18–25 years) are more vulnerable to the use of hookah than are teens or older adults, and there is empirical evidence to indicate that decisions during this developmental stage strongly influence tobacco use behavior [32]. Young adults who perceive emerging adulthood as a time of experimentation

and possibility have increased risk factors for hookah use, suggesting that developmental processes are associated with product features that create patterns of use [33].

Hookah use by future health professionals is a concern. A growing body of literature indicates that university students are not as well-educated as they should be about making choices to smoke hookah, with health-care student research indicating that 49% of students had previously used or tried hookah smoking and 58% indicating they believed cigarette smoking was more harmful than waterpipe smoking [36]. This rising trend among the next generation of healthcare workers is unsettling for both patient health outcomes and possible influence on patient education and public health messaging.

Hookah use today is rarely singular, and robust patterns of poly-tobacco use and other substance co-administration are observed in young adults [33]. Around 15% of users were currently using poly tobacco, and more than 70% of poly tobacco users were consuming cigars, little cigars, or clove cigarettes with one or more products [22]. Another trend is the use of hookah devices for substances other than tobacco, with an estimated 23.6 million (9.7%) U.S. adults ever having used marijuana from 2015–2019, showing growth in alternative substance delivery systems [38].

Sex and gender minority groups demonstrate heightened risk patterns in hookah smoking [22]. In line with research, ever and current hookah smoking in sexual minority adults was higher than heterosexuals (ever use Wave 1: 29% and Wave 2: 31%; current use Wave 1: 4% and Wave 2: 3%) than heterosexuals (ever use Wave 1: 16% and Wave 2: 16%; current use Wave 1: 1% and Wave 2: 1%) [39,40]. This also applies to product modification, whereby sexual minorities experience higher percentages of sexual minority adults modified to hookah and e-product use from 2013–2015.

One of the strongest explanations for the trends in hookah use among young adults involves pervasive misconceptions about comparative harm compared to cigarettes [32,36]. Despite scientific evidence demonstrating drastic health risks, young adults still believe hookah is safer than cigarettes, and hookah users consider it less dangerous than smoking cigarettes. However, evidence indicates that hookah smoke contains a lot of the same toxic substances found in cigarette smoke, such as nicotine, tar and heavy metals [29,30]. Studies have consistently demonstrated that hookah smoke users are exposed to 9 times more carbon monoxide and 1.7 times more nicotine than from a single cigarette, debunking common myths about the effectiveness of water filtration [31].

The hookah industry has adapted to regulatory pressures and changing consumer preferences through product innovation and promotional activities [33]. Epidemiologic evidence suggests that flavor is a strong driver of tobacco product use, including hookah, by youth and young adults, leading to industry efforts to maintain access to flavors in the face of regulation. The emergence of electronic hookah products represents a significant innovation in response to regulatory constraints and consumer interest in technologically enhanced tobacco consumption experiences [28,39].

3.4. Current Trends and Prevalence of Hookah Smoking

Hookah use in the United States between 2019 and 2025 reflects shifting demographic and behavioral patterns. Youth engagement, once rising, has declined since 2020, with prevalence among 12th graders falling to 2.7% by 2024 [41]. Despite this decline, hookah remains appealing to young adults aged 18–24, particularly in college and social settings where perceptions of reduced harm and strong social norms continue to influence use [42].

National surveillance systems provide additional insight into these trends. Youth estimates in this section come primarily from the National Youth Tobacco Survey (NYTS), which reported that 0.7% of middle and high school students used hookah in 2024, down from 1.3% in 2020 and 7.8% in 2018 [20]. Among 12th graders, Monitoring the Future

(MTF) data show a similar decline, from 27.3% in 2018 to 2.7% in 2023, reflecting the impact of strengthened tobacco control policies [41]. These surveillance systems differ in sampling frames and survey years, and such differences should be considered when interpreting trends.

Adult use remains more common than youth use and is concentrated among men and individuals living in urban, culturally diverse neighborhoods. According to the CDC MMWR Tobacco Use Report (2025), 12.3% of adults aged 19–30 reported past-year hookah use [43], with the highest prevalence among adults aged 25–34, who accounted for nearly half of all adult users in 2022 [44]. Patterns of use are also shaped by socioeconomic and regional factors: higher education and income levels are associated with increased likelihood of hookah use [43], and prevalence is highest in Western states such as California and Colorado, where hookah lounges and cultural visibility are more prominent [15].

Additional national surveys reinforce these patterns. NYTS and MTF both show that while cigarette smoking has continued to decline among adolescents and young adults, hookah use has not followed the same trajectory [45,46]. Gentzke et al. (2019) reported that 15.7% of high school students used hookah, with 26.2% of current users reporting frequent use [47], underscoring the need for continued surveillance and targeted prevention efforts.

3.5. Health Implications and Risks of Hookah Use

A substantial and growing body of evidence from global health agencies and peer-reviewed research highlights the serious health risks associated with hookah smoking [15,27,48]. Despite widespread misconceptions that hookah is safer than cigarettes, data from the CDC and WHO show that hookah smoke contains significant concentrations of nicotine, carbon monoxide, and carcinogens—often at levels exceeding cigarettes [15,49].

Nicotine exposure from hookah smoking produces both acute and chronic physiological effects. Acute nicotine effects include rapid increases in heart rate, blood pressure, and sympathetic nervous system activation. Chronic nicotine exposure contributes to long-term dependence, endothelial dysfunction, heightened cardiovascular risk, chronic obstructive pulmonary disease (COPD), and various cancers [27,30]. These risks arise from nicotine itself, independent of combustion-related toxicants. CDC data indicate that a single hookah session results in substantially higher exposure to nicotine and carbon monoxide than cigarette smoking. With repeated use, individuals face cumulative harms, including impaired lung function, vascular inflammation, and heightened stroke risk [15]. Toxicological assessments further underscore these dangers. A typical 45-min hookah session delivers approximately 802 mg of tar—nearly 37 times that of a single cigarette—and exposes users to seven known carcinogens, 39 central nervous system depressants, and 31 respiratory irritants [29,31]. The ultrafine particulate matter generated by hookah smoke penetrates deeply into the lungs, triggering oxidative stress, inflammation, and endothelial dysfunction [49]. In addition, carbon monoxide inhalation elevates carboxyhemoglobin levels beyond safe thresholds, increasing risks of hypoxia, myocardial infarction, and other cardiovascular events [50]. Bhatnagar et al. further reinforces the link between hookah use and cardiovascular morbidity [30].

Oral health outcomes linked to hookah use are equally concerning. A 2022 study using PATH data published in JAMA Network Open found strong associations between hookah use and periodontal disease, gingival bleeding, and tooth loss [51]. Reviews in Environmental Health & Preventive Medicine highlight DNA damage in lymphocytes and increased prenatal exposure, raising concerns about cellular degeneration and impaired fetal development.

The harm of hookah smoke extends beyond direct users. Secondhand and thirdhand exposure to hookah smoke presents additional risks, especially in enclosed environments.

Thirdhand smoke (THS) refers to the persistent residue of nicotine and other toxicants that settle onto indoor surfaces, dust, and fabrics after smoking has ceased. These residues can re-emit into the air or undergo chemical reactions that generate new carcinogens, including tobacco-specific nitrosamines (Jacob et al.; 2017) [52]. CDC reports (2022) identify hookah smoke as a major contributor to indoor air pollution, exposing nonsmokers—particularly children, older adults, and those with preexisting conditions—to elevated levels of toxic substances [53].

Public health authorities have responded with calls for stronger regulatory oversight, targeted educational campaigns to dispel safety myths, and integration of hookah-specific cessation programs into broader tobacco control efforts [15,54,55]. Shared mouthpieces also facilitate transmission of infectious diseases, including herpes simplex virus, hepatitis, tuberculosis, and COVID-19 [15].

Recent research highlights molecular consequences of intermittent hookah use, including epigenetic modifications and cellular injury linked to inflammation, immune dysregulation, and increased cancer susceptibility [9]. These findings underscore the need for comprehensive public health strategies that address both immediate and trans-generational risks. Collectively, these findings underscore the urgency of public health interventions targeting hookah use. The perception of hookah as a safer alternative is not supported by current toxicological evidence and requires continued surveillance, education, and regulation.

3.6. Regulatory Developments

The U.S. Food and Drug Administration (FDA) extended regulatory authority to include hookah tobacco under the 2016 “Deeming Rule,” requiring manufacturers to list ingredients, add warning labels, and refrain from false advertising [56–59]. However, enforcement has been inconsistent, particularly for flavored hookah products that remain widely available.

At the state and municipal levels, efforts vary. Cities like New York and San Francisco have adopted zoning ordinances that limit where hookah lounges can operate, citing public health concerns [60]. Meanwhile, California’s SB 793 sought to ban the sale of all flavored tobacco products, including those used in hookah, although implementation has faced legal challenges [61].

Some cities have also mandated ventilation requirements and age restrictions for hookah lounges. For instance, Los Angeles County requires hookah establishments to obtain a tobacco retailer license and comply with air quality standards [62]. Public education campaigns are another regulatory response. The CDC’s “Tips from Former Smokers” campaign and the FDA’s “The Real Cost” have begun incorporating messages targeting alternative tobacco product use, including hookah.

3.7. Social and Cultural Influences

Hookah smoking is more than a method of tobacco consumption; it is a ritualized social activity deeply embedded in cultural practices. The process of preparing the hookah—selecting flavored tobacco, arranging the charcoal, and collectively sharing the waterpipe—creates an atmosphere of bonding, relaxation, and cultural expression [63–65]. Qualitative and mixed-methods research conducted in the United States has consistently shown that hookah smoking functions as a ritualized social activity, fostering emotional energy, solidarity, and a sense of community among users. Jehi et al. (2024) found that youth in Virginia and California described hookah use as a culturally expressive and socially connective practice, often embedded in group rituals and shaped by environmental norms [3]. Similarly, El Shahawy et al. (2020) reported that among ethnically diverse college

students in New York City, hookah smoking was strongly influenced by peer networks and social bonding, with many users engaging in the practice primarily in communal settings [65]. National survey data further support these findings: Agaku et al. (2018) observed that hookah use among U.S. youth frequently occurred in home-based social environments, reinforcing descriptive norms and shared identity [66]. Collectively, these studies underscore the symbolic and relational dimensions of hookah smoking in American contexts; particularly for second-generation immigrants from Middle Eastern and South Asian backgrounds, hookah smoking offers a way to reconnect with cultural roots and traditions [3,65,66].

In addition to traditional social influences, social media plays a substantial role in promoting and normalizing hookah use. Analyses of Instagram posts tagged with #hookah or #shisha reveal that the vast majority (99.6%) depict hookah smoking positively, often in luxurious, social, or nightlife settings [4]. Other studies have found that hookah-related content on social media often overlaps with depictions of alcohol use, further glamorizing a lifestyle associated with nightlife and social status [5].

Celebrity endorsements and media portrayals also impact youth attitudes toward hookah use. A systematic review and meta-analysis further confirmed that exposure to tobacco-related content on social media increases the likelihood of tobacco use among adolescents [67]. Overall, the enduring appeal of hookah smoking lies not only in its sensory enjoyment but also in its cultural, communal, and media-driven significance, reinforcing its status as both a social ritual and a symbol of identity for many users.

4. Discussion

This narrative review synthesizes current evidence on hookah use among young adults in the United States and reveals a complex interplay of behavioral, toxicological, sociocultural, and regulatory factors that sustain its appeal. Although national surveillance data indicate modest declines in current hookah use among adolescents, the broader pattern reflects a shifting rather than diminishing public health burden. Lifetime exposure continues to rise, poly-substance use is increasingly common, and marijuana use via hookah devices is emerging as a new behavioral trend. These findings highlight the need for a more integrated public health response that accounts for evolving patterns of use.

A consistent theme across the literature is the persistence of misperceptions regarding the relative safety of hookah smoking. Misperceptions of reduced harm remain a central driver of hookah use, even though toxicological evidence consistently demonstrates exposure to nicotine, carbon monoxide, and carcinogens at levels comparable to or exceeding cigarette smoke. The misconception that water filtration reduces toxicant exposure remains widespread, even though research shows that water removes little to none of the harmful chemicals. Addressing these misperceptions is essential for effective prevention.

Another important pattern identified in this review is the increasing prevalence of poly-tobacco and poly-substance use. Hookah smoking rarely occurs in isolation; instead, it is frequently combined with alcohol, cannabis, cigars, or e-cigarettes. Sexual minority adults and young adults with indicators of poor mental health demonstrate particularly elevated rates of concurrent use. The growing use of hookah devices to smoke marijuana—reported by nearly 10% of U.S. adults—represents an emerging trend with unknown long-term health implications. These findings suggest that hookah use is embedded within broader substance-use trajectories, highlighting the need for integrated prevention strategies that address multiple products simultaneously rather than focusing solely on tobacco.

Toxicological evidence further reinforces the urgency of addressing hookah use among young adults. Traditional hookah smoking exposes users to substantial levels of carbon monoxide and particulate matter due to the use of burning charcoal, while electronic hookah

products—often perceived as cleaner or safer—have been shown to cause acute endothelial dysfunction and cardiovascular stress. These toxicological risks remain underrecognized in public discourse and are insufficiently addressed in current regulatory frameworks. A reviewer correctly noted that earlier versions of this manuscript underemphasized these toxicological mechanisms; the present discussion foregrounds them as central to understanding the health risks associated with hookah use.

Sociocultural and environmental factors also play a critical role in shaping hookah use patterns. Hookah smoking is often embedded in cultural traditions, particularly among Middle Eastern and South Asian communities, where it may serve as a symbol of hospitality, identity, or social bonding. Spatial analyses reveal that hookah lounges cluster near college campuses, creating environments that normalize and facilitate use among young adults. Social media further amplifies positive portrayals of hookah, with nearly all Instagram posts tagged with hookah depicting it favorably. These sociocultural drivers highlight the need for culturally responsive interventions that acknowledge community norms while addressing health risks.

Regulatory gaps further complicate efforts to reduce hookah use. Although the FDA regulates hookah tobacco, enforcement remains inconsistent, and flavored hookah products often fall outside the scope of local flavor bans. Hookah lounges operate with variable oversight, and ventilation standards are not uniformly enforced. These regulatory inconsistencies create environments where hookah remains accessible, appealing, and socially reinforced. Strengthening regulatory consistency—particularly around flavors, charcoal use, and lounge operations—represents a critical policy priority.

Taken together, the findings of this review indicate that hookah use among young adults is sustained by a complex interplay of misperceptions, toxicological risks, sociocultural norms, and regulatory gaps. This review contributes to the literature by integrating these dimensions into a cohesive framework and highlighting the need for multi-level interventions that combine policy reform, targeted education, and culturally informed public health strategies.

4.1. Recommendations to Reduce Hookah-Related Risks

The findings from this review reveal substantial gaps in regulatory policy, public health practice, and targeted intervention strategies related to hookah use among young adults. Unlike cigarette smoking, hookah-specific regulations remain inconsistent and poorly defined, with no standardized guidelines governing product ingredients, device components, or environmental safety in hookah lounges. This lack of transparency contributes to persistent misconceptions about the safety of hookah smoking and limits the effectiveness of current public health efforts. Strengthening warning labels and product transparency is therefore essential. Standardized nicotine content labeling and explicit addiction warnings should be required across all hookah tobacco and electronic hookah products. Nicotine dependence is a chronic, relapsing disease with significant health impacts [15], and consumers must be informed of these risks. Clear labeling may also counter the widespread belief that hookah smoke is less harmful than cigarette smoke.

Given the developmental context of emerging adulthood—often characterized by experimentation and identity exploration—targeted prevention campaigns must address both product-specific misconceptions and the broader social and developmental factors that drive hookah use. Messaging should explicitly communicate that nicotine has abuse potential and long-term neurobiological effects, and that water filtration does not reduce toxicant exposure. Correcting misperceptions about “smoothness” is particularly important, as sensory cues strongly influence young adults’ risk perceptions.

Environmental regulation is another critical area for intervention. Hookah lounges frequently reach elevated levels of particulate matter, even when ventilation systems are present [68]. Enforcing ventilation standards, implementing smoke-free policies, and strengthening local licensing and zoning requirements would reduce secondhand and thirdhand smoke exposure for both patrons and workers. These measures are especially important in college communities, where hookah lounges cluster near campuses and serve as social hubs for young adults.

There is also a clear need to expand cessation support, particularly for populations with elevated risk. Young adults and sexual/gender minority groups demonstrate disproportionately high rates of hookah use and poly-tobacco use. Integrating hookah-specific content into cessation programs and developing culturally competent, tailored interventions may help reduce disparities in tobacco-related harm.

From a research perspective, advancing surveillance and scientific evaluation of emerging electronic hookah devices is essential. Waterpipe toxicant profiles vary widely by device design, heating method, and charcoal type, yet regulatory science has not kept pace with these innovations. Longitudinal studies are needed to assess the long-term cardiovascular, respiratory, and neurocognitive outcomes associated with both traditional and electronic hookah use. Research should also examine transitions between hookah, e-hookah, and other nicotine products to inform prevention and cessation strategies.

Finally, the campus environment presents unique opportunities for policy and educational interventions. Because hookah use is concentrated in college settings, campus-based tobacco policies, environmental modifications, and targeted educational programs may be particularly effective. However, these interventions must be designed with an understanding of the developmental, cultural, and social factors that shape hookah use among emerging adults.

Together, these implications underscore the urgent need for comprehensive, culturally sensitive, and developmentally informed public health strategies to address the rising burden of hookah use among young adults in the United States.

4.2. Limitations

This review has several limitations and strengths. Some limitations should be considered when interpreting the findings of this review. First, formal systematic and comprehensive search strategies were not conducted. There may be possible selection bias in the selection process. Second, the literature and guideline searches were conducted by one researcher who is an expert in hookah and smoking. Selection bias, reviewer bias, and publication bias may exist due to possible subjective interpretations. Third, a formal methodological quality appraisal or risk-of-bias assessment was not performed, as this review was intended to provide a broad narrative synthesis rather than a systematic evaluation of evidence quality. Lastly, the heterogeneity of hookah products, contexts, and user populations complicates efforts to develop generalizable findings.

However, this study has several strengths. First, this study provides broad and current knowledge about hookah, which is understudied due to mistaken beliefs and judgmental norms. Also, the data sources of this review are not only research articles but also guidelines and statistics from federal or public health agencies to provide comprehensive and current information. This rapid review provides meaningful information to assess where we are now and where we should move forward.

5. Conclusions

Hookah smoking continues to pose a significant public health concern among young adults in the United States, despite recent declines in current use among adolescents. The

evidence synthesized in this review demonstrates that lifetime exposure, poly-tobacco use, and marijuana use via hookah devices are increasing, indicating a shift in patterns rather than a reduction in risk. Toxicological findings clearly show that both traditional and electronic hookah products deliver substantial levels of harmful chemicals—including carbon monoxide, nicotine, polycyclic aromatic hydrocarbons, and heavy metals—contradicting persistent perceptions that hookah is a safer alternative to cigarettes.

The review also highlights the influence of sociocultural norms, social media portrayals, and the clustering of hookah lounges near college campuses, all of which reinforce hookah's appeal among young adults. Regulatory gaps, particularly around flavored products, charcoal use, and ventilation standards in lounges, further contribute to ongoing exposure and misperceptions of reduced harm.

Based on these findings, several priorities emerge. Future research should examine longitudinal trajectories of poly-substance use, assess the toxicological profiles of emerging e-hookah products, and evaluate culturally tailored interventions for high-risk groups such as college students, sexual minority adults, and Middle Eastern/ Arab American communities. Policy efforts should focus on closing flavor loopholes, strengthening enforcement in commercial hookah establishments, and improving public awareness of toxicant exposure associated with both traditional and electronic hookah use.

Overall, this review underscores the need for coordinated, evidence-informed strategies that integrate policy reform, targeted education, and culturally responsive approaches to reduce hookah-related harms among young adults.

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Abbreviations

The following abbreviations are used in this manuscript:

CDC	Centers for Disease Control
WHO	World Health Organization
FDA	Food and Drug Administration

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