

# Hookah's new popularity among US college students: a pilot study of the characteristics of hookah smokers and their Facebook displays

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## ABSTRACT

**Objectives:** (1) To confirm the prevalence of hookah use among US college students. (2) To identify substances commonly smoked in hookahs and other substance use characteristics of hookah smokers. (3) Given the powerful influence of Facebook and its potential role in promoting behaviours, to assess the prevalence of hookah references on Facebook profiles.

**Design:** Cross-sectional study.

**Setting:** Two large US universities; [www.Facebook.com](http://www.Facebook.com).

**Participants:** 307 Facebook profiles were coded and 216 of these profile owners completed an online survey. On average, participants were 18.8 years old (SD=0.7), women (54%), Caucasian (70.4%) and approximately half were from each university.

**Outcome measures:** Lifetime and frequency of hookah use, substance smoked in hookah, cigarette and marijuana use, hookah references displayed on Facebook.

**Results:** 27.8% of participants endorsed hookah use; there were no significant differences between age, gender, race or university for hookah use. Hookah users reported smoking tobacco (78%), hash (12%) and both tobacco and marijuana/hash (10%) in their hookah. Compared with non-hookah smokers, hookah smokers were more likely to report using cigarettes (OR=3.41, 95%CI=1.2 to 9.64) and marijuana (OR=15.01, 95%CI=6.5 to 34.65). Hookah references were present on 5% of Facebook profiles.

**Conclusions:** More than one quarter of college students smoke hookah. Most smoke tobacco in their hookah, and hookah smoking is associated with polysubstance use. Hookah may present new risks for nicotine addiction in this population.

## INTRODUCTION

Tobacco use is the leading preventable cause of morbidity and mortality worldwide. Encouragingly, public health efforts have successfully decreased the prevalence of cigarette smoking in the USA by half over the past 45 years.<sup>1</sup> This achievement is attributed

## ARTICLE SUMMARY

### Article focus

- To confirm the prevalence of hookah use among US college students.
- To identify characteristics of US college student smokers, including substances typically smoked in a hookah.
- To determine the prevalence of hookah references on Facebook profiles belonging to US college students.

### Key messages

- Hookah smoking is becoming increasingly popular and more than 25% of college students smoke hookah.
- Hookah smoking is significantly associated with cigarette and marijuana use, and some college students smoke marijuana in their hookah.
- Some college students reference hookah on their Facebook profiles.

### Strengths and limitations of this study

- This is the first study to examine what substances college hookah smokers use in their hookah, and the presence of hookah references on Facebook.
- The validity of hookah references on Facebook remains unknown.

to the first Surgeon General's report on smoking and health in 1964, taxation, indoor smoking bans, media advertising restrictions and counter-advertising campaigns, and increased public awareness of the harms associated with cigarette smoking.<sup>2</sup>

Despite this laudable public health accomplishment, the use of alternative forms of tobacco is currently rising, threatening these successful efforts. Of particular concern is the increasing popularity of hookah.<sup>3</sup> Hookah use, also known as shisha, narghile and waterpipe, is defined as the smoking of substances through a waterpipe such that the smoke passes through water and is cooled

prior to inhalation. Smoking a waterpipe is a tradition dating back at least four centuries to origins in northern Africa and southwest Asia.<sup>4</sup> Until recently, smoking in this fashion remained primarily a tradition observed in Middle Eastern countries, most popular among adult men.<sup>5</sup>

At present, hookah smoking is becoming an increasingly popular form of tobacco use worldwide. Spreading from the Eastern Mediterranean region, hookah use is now common in Western countries including Australia, the UK, Canada and the USA.<sup>3</sup> Further, hookah is becoming increasingly popular among youth. A recent global surveillance study examining time trends (1999–2008) of tobacco use in youth found an increase in hookah smoking among teens as young as 13-year-olds to 15-year-olds.<sup>3–6</sup> In the USA, adolescents and young adults are at the forefront of this resurgence.

The understanding of hookah-smoking patterns among youth remains incomplete. Current estimates suggest that 15–41% of undergraduate college students smoke hookah.<sup>7–11</sup> Further, while hashish or opium were once smoked in hookahs in the Middle East and India,<sup>5, 12</sup> smoking tobacco in hookahs was popularised in the 1990s with the introduction of *maassel*, a sweetened and flavoured tobacco product.<sup>3</sup> Some reports suggest marijuana, hashish or other drugs are sometimes added to hookah tobacco.<sup>13</sup> However, the predominate substances smoked in hookahs and other substance use practices of hookah users among US teens remain unknown.

Therefore, the primary purpose of this pilot study was to confirm the lifetime prevalence of hookah smoking among undergraduate students at two large public universities in different regions of the USA. The second aim of this study was to identify the specific substance use practices of hookah smokers, including the predominant substance that young adults smoke in their hookah, and other substance use characteristics of hookah smokers. Identifying these characteristics of hookah smokers has numerous public health and clinical implications, and is a necessary step in developing targeted prevention and intervention strategies.

Finally, how and why hookah smoking is gaining popularity among young adults also remain unclear. Many attribute hookah's popularity to its social nature; hookah use is a shared, communal experience and two or more people often share a single waterpipe.<sup>4–6</sup> It is also possible that new forms of media are playing a role in promoting hookah smoking among young adults. Recent work suggests hookah-related videos on YouTube, compared with cigarette-related videos, are less likely to reference the harmful consequences of smoking or provide antismoking messages.<sup>14</sup> As cultivation theory suggests, online videos may influence viewers' opinions and perceptions; videos that fail to portray the negative consequences of hookah smoking may serve to promote this behaviour among young adults.<sup>15</sup>

The authors hypothesise that social networking websites (SNSs) may also popularise hookah smoking by

serving as a venue in which young adults learn about and promote hookah use among their social groups. In recent years, SNSs such as Facebook have become a tremendously popular source of social media among adolescents and young adults; Facebook is now used by over 90% of college students and is the most popular SNS among university students.<sup>16</sup> While previous studies have found associations between consuming media, such as television and movies, depicting tobacco and the initiation of tobacco use, it has been argued that Facebook may have greater influence than traditional media because Facebook combines the power of interpersonal persuasion with the reach of mass media.<sup>17–18</sup> Specifically for adolescents and young adults, for whom peers are the most important source of influence, the power of interpersonal persuasion cannot be underestimated.<sup>19</sup> Some suggest that these websites may serve as a media 'super-peer' by promoting norms of behaviour among adolescents.<sup>20</sup> Additionally, social learning theory predicts that adolescents observe, imitate and model behaviours they see in their peers.

Thus, the third objective of this study was to conduct a pilot investigation of the presence of hookah references on Facebook. As a social networking site, Facebook may provide a venue for peer interaction and social networking, both of which are recognised as contributors to risk behaviours.<sup>21</sup> Risk behaviours such as alcohol and drug use have been found to be displayed on SNS profiles.<sup>21</sup> It is therefore possible that hookah is also displayed online within social networks, but the extent to which this is so remains unknown.

## METHODS

This study was conducted between September 2009 and December 2011 and received IRB approval from both the University of Wisconsin and the University of Washington.

### Setting

Participants for this study attended one of two large, public universities, in the Midwest and on the West Coast. Participants were recruited via the social networking website Facebook ([www.Facebook.com](http://www.Facebook.com)). This SNS was selected because it is the most popular SNS among the target population of college students.<sup>22</sup>

### Subject selection

The Facebook search engine was used to identify random public profiles registered within either university network that listed a graduation year indicating the profile owner was a freshman, sophomore or junior student. Inclusion criteria required profile owners to report an age on their profile between 18 and 20 years and to show evidence of profile activity within the last 30 days.

All profiles returned in the search results were assessed sequentially for eligibility. Profiles were

excluded if they did not meet search criteria (ie, incorrectly listed), including those who were not undergraduates (N=448), did not meet the age criteria (N=313) or did not display their age (N=49). Profiles were also excluded if their profiles were completely private, had any one of the following sections set to private: information section, wall or photographs (N=1630), or if the profile owner was not reachable for recruitment (ie, no phone number or email listed on Facebook profile or in the university directory) (N=303). In order to reach a target survey sample size of 200 participants, a total of 307 eligible Facebook profiles were identified in 2009 and 2010 and invited to participate in the study. Demographic data were recorded from eligible profiles.

### Recruitment

The 307 profile owners with profiles that met inclusion criteria were called on the phone. The phone call served two purposes. First, profile owner's identity and age were verified. Second, eligible students were then recruited to participate in the online survey. Survey invites were only sent to profile owners whose identity could be confirmed over the phone. The study was explained to the profile owner and permission was requested to send an email that contained further information about the study. If the participant consented to receive the email, an email was sent that provided detailed information about the study as well as a link to an online survey. The survey was administered online via a Catalyst WebQ online survey engine. Survey respondents were provided a \$15 iTunes gift card as compensation.

### Survey

The online survey evaluated hookah use. Participants were asked about their lifetime experience using hookah. Those who reported ever using hookah were also questioned about their frequency of use; answer options included never, monthly or less, 2–4 times a month, 2–3 times a week, 4 or more times a week. Participants were also asked what substances they typically smoked in their hookah; answer options included tobacco, marijuana, hash, a mix of marijuana/hash and tobacco. All participants were also questioned about their lifetime experience and frequency of use of marijuana and cigarettes, with similar answer options for frequency as described above.

### Facebook profile coding

To investigate the presence of hookah references on college students' Facebook profiles, all 307 profiles were evaluated once by one of three trained coders using a research codebook. This codebook has been previously used to evaluate the display of other health-risk behaviour references on SNS profiles such as alcohol and violence.<sup>23 24</sup> The codebook was adapted for this study to code for references to hookah. In order to determine whether hookah references were present, coders viewed

all publicly accessible elements of the Facebook profile including profile owners' tagged pictures, profile pictures, information sections and their Wall. Both images and text were coded and hookah reference data included the coder's typewritten description of any image references or verbatim text from profiles usually found in the form of status updates or in the Info Section. If present, identifiable information was removed from text references. One year of profile data were assessed for each participant, starting from the date of evaluation and going back to the same date, 1 year prior.

Profiles were categorised into one of two groups. Profiles with one or more references to hookah use were classified as hookah 'Displayers'. Example references included personal photographs in which the profile owner was smoking a hookah, or text references describing smoking hookah. Only photographs that contained the profile owner with a clearly identifiable hookah and text references that explicitly mentioned the word hookah or a synonym of hookah, such as shisha or narghile, were coded. Profiles without any hookah references were considered 'Non-Displayers'.

Because of infrequent references to hookah on Facebook, inter-rater agreement was used to assess coder reliability. A 20% random subsample of profiles was evaluated by all three coders and 96% inter-rater reliability was achieved.

### Analysis

Demographic characteristics, frequency and prevalence of hookah use and Facebook displays of hookah were summarised using descriptive statistics. Bivariate logistic regression was used to examine covariates of lifetime hookah use (outcome); ORs and their 95% CI were obtained for independent variables including age, gender, race/ethnicity, university and substance use. A multivariate model of lifetime hookah use was also fit, including the covariates of age, gender, race/ethnicity, university and substance use. Bivariate comparisons between demographic characteristics and hookah Displayer/Non-Displayer groups were conducted using Fisher's exact tests and  $\chi^2$  tests. All statistical analyses were conducted using STATA V.11.0 (Statacorp, College Station, Texas, USA). A two-sided p value  $p < 0.05$  was considered statistically significant.

## RESULTS

### Subjects

A total of 307 Facebook profiles were coded; 216 (70% response rate) of these individuals completed all survey questions with viable answers and were included in the analyses. Participants had an average age of 18.8 years (SD 0.7), were 54.2% women and 70.4% Caucasian. Approximately half of participants were from each university. See [table 1](#) for further details.

**Table 1** Descriptive characteristics of survey respondents (n=216)

Variable	Per cent (n)		
	Total	Hookah non-users (n=156)	Hookah users (n=60)
Age (years)*			
18	35.7% (77)	36.5% (57)	33.3% (20)
19	50.9% (110)	48.1% (75)	58.3% (35)
20	13.4% (29)	15.4% (24)	8.33% (5)
Gender			
Male	47.2% (102)	45.5% (71)	51.7% (31)
Female	52.8% (114)	54.5% (85)	48.3% (29)
State			
Washington	46.8% (101)	47.4% (74)	45.0% (27)
Wisconsin	53.2% (115)	52.6% (82)	55.0% (33)
Race/ethnicity†			
Caucasian	70.4% (150)	68.0% (104)	76.7% (46)
African American	0%	0%	0%
Asian/Pacific Islander	18.8% (40)	20.9% (32)	13.3% (8)
Hispanic	2.3% (5)	2.6% (4)	1.7% (1)
Other/multiracial	8.5% (18)	8.5% (13)	8.3% (5)

\*Overall mean (SD), 18.8 (0.7) years.

†Three missing values.

## Survey results

### Prevalence of hookah use

Lifetime hookah use was reported by 27.8% (N=60) of participants (table 2). Participants who reported ever using hookah were on average 18.8 (SD 0.6) years of age, and tended to be men (51.7%) and Caucasian (76.7%; table 1). There were no significant differences between age, gender, race or university for hookah use. Of those who reported ever smoking hookah, 78.3% smoked hookah monthly or less and 21.6% were current users who reported smoking hookah more than once per month.

### Substances smoked in the hookah

More than three-quarters (78%) of those who reported ever smoking hookah reported primarily smoking tobacco in their hookah. Only 12% reported smoking only hash in their hookah, while 10% reported smoking both marijuana/hash and tobacco in their hookah. A total of 22% reported using a hookah to smoke marijuana.

**Table 2** Survey results: endorsement of substance use

Variable	Per cent (n)		
	Total	Hookah non-users*	Hookah users†
Hookah	27.8% (60)	0%	100% (60)
Cigarettes	16.2% (35)	7.1% (11)	40% (24)
Marijuana‡	30.7% (66)	13.6% (21)	75% (45)

\*n=156.

†n=60.

‡Three missing values.

### Hookah users engagement with other substances

Of those who reported ever using hookah, 40% reported ever smoking cigarettes, of whom 42.7% reported smoking cigarettes more than once a month. Most (75%) hookah users reported ever using marijuana, of whom 51% reported using marijuana more than once per month. No hookah users endorsed cigarette use only; all hookah smokers who smoked cigarettes also smoked marijuana (table 3).

Multivariate modelling of lifetime hookah use indicated that those who endorsed hookah use were more likely to report other substance use. Hookah users were more likely to use cigarettes (OR=3.41, p<0.05) and marijuana (OR=15.01, p<0.001) compared with non-hookah smokers (table 4).

### Facebook results

Hookah references were present on 5.3% of Facebook profiles. There were no significant differences in hookah display between gender, race or university. Examples of hookah references included personal images of profile owners smoking a hookah, downloaded images of icons saying 'I ♥ HOOKAH', or status updates such as 'Tonight is a hookah type of night, I love nights like these' and 'Skippin' class all day, goin' hookah shopping, fun!'

## DISCUSSION

This study explored characteristics of college student hookah smokers and evaluated the presence of hookah references displayed on university students' public Facebook pages. More than one-quarter of college students reported smoking hookah and this prevalence

**Table 3** Survey results: endorsement of substance use by hookah use

Variable	Per cent (n)			
	Cigarettes only	Marijuana only	Cigarettes and marijuana	None
Hookah users (n=60)	0	35% (21)	40% (24)	25% (15)
Hookah non-users (n=155)*	4.5% (7)	11% (17)	2.5% (4)	82% (127)

\*One missing value.

estimate is consistent with the national estimate of hookah use among young adults enrolled in college.<sup>25</sup> To the authors' knowledge, this is the first study to survey college students about what substances they smoke in their hookah. The majority of hookah smokers reported smoking tobacco in their hookah, yet more than 20% reported experience with using marijuana or hash in their hookah. These findings support the rising popularity and diversity of hookah use among young adults in the USA.

The finding that so many college students are smoking hookah, and specifically smoking tobacco in their hookah, is cause for clinical and public health concern. Although the health effects of hookah have not been studied nearly as extensively as cigarettes, smoking tobacco in a waterpipe is associated with negative health outcomes similar to those associated with cigarette use. Studies compare hookah to cigarettes and illustrate that both forms of tobacco use expose smokers to toxicants associated with cardiovascular and lung disease, including carbon monoxide and polycyclic aromatic hydrocarbons.<sup>3 26</sup> Further, hookah use significantly increases one's risk of lung cancer, respiratory illness, low birthweight and periodontal disease.<sup>27</sup> Lastly, preliminary research shows hookah use may be associated with nicotine dependence and could be a gateway drug to cigarette smoking.<sup>3 28</sup>

These negative health consequences of hookah use are compounded by the many misperceptions and incorrect beliefs and attitudes held by hookah users. Many hookah smokers underestimate the health risks and addictive properties of hookah use. In contrast to the

published harms of hookah use, college students and young adults believe smoking tobacco in a waterpipe is less harmful and less addictive than cigarettes and believe they can quit anytime.<sup>29 30</sup>

Similar to other studies, the results of this study suggest that hookah users were more likely than non-hookah users to engage in substance use (separate from their hookah smoking) such as marijuana, cigarettes and other psychoactive drugs.<sup>10 31 32</sup> Due to the cross-sectional nature of this study, it is impossible to determine the temporal sequence of hookah smoking and the use of other substances. However, it may not be surprising that hookah smokers also engage in other substance use behaviours. Previous research supports that engagement in one risk behaviour is often associated with an increased likelihood of engaging in other risk behaviours.<sup>33</sup> This may be especially true for hookah, cigarettes and marijuana, all different means of smoking. It may be that once a college student decides to engage in a smoking behaviour, they may be open to a variety of smoking behaviours. These results suggest hookah prevention efforts may be paired with other substance use and general smoking prevention strategies.

The findings that one in five hookah smokers smoke marijuana in their hookah and that hookah smokers are more likely to smoke marijuana separately compared to non-hookah smokers, are important for two reasons. First, given that many college students maintain that hookah smoking is a safe alternative to cigarette smoking and that hookah smoking does not constitute 'smoking',<sup>11</sup> it is possible that these young adults differentiate between methods of tobacco use. Similarly,

**Table 4** Multivariate logistic regression modelling of lifetime hookah use (n=216)

Variable	Unadjusted OR (95% CI)	Adjusted OR† (95% CI)
Age	0.92 (0.58 to 1.44)	0.86 (0.47 to 1.57)
Gender	0.78 (0.43 to 1.42)	1.22 (0.55 to 2.70)
Race		
Caucasian	Reference group	Reference group
Asian/Pacific Islander	0.57 (0.24 to 1.32)	0.59 (0.18 to 1.99)
Hispanic	0.57 (0.60 to 5.20)	0.19 (0.02 to 2.45)
Other/multiracial	0.87 (0.29 to 2.58)	2.25 (0.58 to 8.75)
University	1.1 (0.61 to 2.00)	0.95 (0.40 to 2.26)
Cigarettes	8.79 (3.94 to 19.59)	3.41 (1.20 to 9.64)*
Marijuana	19.14 (9.10 to 40.27)	15.01 (6.50 to 34.65)*

\*p&lt;0.05.

†OR were adjusted for all other variables in the table.

college students may have altered perceptions of the safety of smoking marijuana in a hookah. Second, given the integration of hookah smoking into the social scene on college campuses,<sup>11</sup> it is possible that marijuana may also experience a sort of social promotion when associated with hookah. This may have implications for intervention strategies and further work is needed to explore these ideas.

To the best of the authors' knowledge, this is also the first study to investigate hookah use using Facebook. These findings show more than 5% of college student profiles display references to hookah on Facebook. While this percentage does not compare with the prevalence of smoking hookah, hookah references on SNSs have not yet been extensively studied. Other work illustrates that adolescents display references to other risk behaviours such as alcohol and substance use on their SNS profile.<sup>21</sup> These displays of various risk behaviours may represent engagement in that behaviour, consideration of engagement in the behaviour, boastful claims or nonsense.<sup>21</sup> College students who display references to intoxication or problem drinking on their Facebook profile were more likely to meet clinical criteria for problem drinking compared to those who do not display such references.<sup>34</sup> In addition, adolescents interpret alcohol displays on SNSs to be influential and valid representations of alcohol use.<sup>35</sup> Thus, these displays are meaningful. Given the social nature of hookah smoking, the social dimension of Facebook may be a salient factor in popularising hookah use. Since students mainly initiate and practice hookah use with friends, Facebook may allow them to find such friends. Further research exploring the presence and meaning of specific hookah displays on Facebook profiles is necessary.

There are several potential limitations to this study. First, participants were recruited from only two universities and the study sample included very few minority and no African American participants. While the study sample is demographically representative of the student population at the two selected universities, it is possible that these two universities do not provide a representative sample of the US college population. The literature suggests that after students of Arab descent, Caucasian students, followed by Asian students have the highest reported prevalence rates of smoking hookah.<sup>11</sup> Therefore, given that the participants were selected from large geographically distinct state universities and that these prevalence estimates are consistent with other studies' estimates, this suggests that these results may be generalisable to the US college population. Second, only profiles from one SNS were evaluated and participants were limited to those who maintained a public Facebook profile and allowed their phone numbers to be listed in either their university directory or on Facebook. The extent to which these findings could be generalised to profiles that have their security set to private, to profiles on other SNSs, or to younger adolescent populations is not known. Third, it is important to note that SNS

profile privacy settings are not permanent; profile owners may change their privacy settings at any time or to reflect what security upgrades are offered by Facebook. It is unclear as to whether profile owners who maintained a private profile at the time of this study would be more likely, or less likely, to display hookah references. Lastly, the cross-sectional design of this study precluded determining the temporal sequence of smoking hookah and engagement in other substance use. Future research including longitudinal studies is needed to explore these associations, especially the potential role of hookah as a gateway to cigarette smoking.

Despite these limitations, the findings have important implications. First, this is the first study to illustrate that hookah use goes beyond tobacco. College students also smoke marijuana and hash in their hookah. With this understanding, future prevention and intervention methods may pair existing tobacco and marijuana strategies when targeting college hookah smokers. Second, hookah use is also emerging on Facebook profiles, which may help promote the illusion that it is a socially acceptable behaviour and safe alternative to cigarettes. To determine if hookah references aid in the promotion of hookah smoking among college students, more work is needed to explore the presence and meaning of hookah displays on Facebook. Further, similar to studies which have found Facebook to be feasible for identifying college students at risk for problem drinking, more work is needed to determine if SNSs may also be helpful for screening and identifying college students at risk for or engaged in hookah smoking.

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