



Short Communication

Prevalence, frequency, and initiation of hookah tobacco smoking among first-year female college students: A one-year longitudinal study

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ABSTRACT

Hookah tobacco smoking has become increasingly prevalent among college students, but little is known about frequency of use or patterns of use over time, including during the transition to college. The goals of this longitudinal cohort study were to assess the: (a) lifetime prevalence, (b) current prevalence, (c) frequency of use, and (d) pattern of initiation of hookah tobacco smoking among female students during the first year of college. First-year female college students ($N = 483$) at a large private university in upstate New York completed 13 monthly online surveys about their hookah tobacco use from August 2009 to August 2010. Lifetime prevalence of hookah use increased from 29% at college entry to 45% at one-year follow-up. The highest rates of hookah initiation occurred in the first two months of students' first semester of college. Current (past 30 days) hookah use ranged from 5% to 13% during the year after college entry. On average, hookah users reported smoking hookah two days per month. Hookah tobacco use is common among female college students. The transition to college is a vulnerable time for hookah initiation. Preventive efforts should begin in high school and continue through college, with a focus on students' first few months on campus.

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1. Introduction

Hookah tobacco smoking, also known as waterpipe or narghile, has been identified as an emerging threat to public health (Knishkowsky & Amitai, 2005; World Health Organization Study Group on Tobacco Product Regulation [WHO], 2005). Its defining feature is that smoke passes through water before being inhaled (Maziak, 2008). Initial findings suggest that using hookah to smoke tobacco "poses a serious potential health hazard" (WHO, 2005, p. 5). Compared to smoking a single cigarette, a single hookah tobacco session exposes users to a higher nicotine dose, greater carbon monoxide, and more than 40 times the smoke volume (Eissenberg & Shihadeh, 2009). Hookah use is associated with impaired lung function (Raad et al., 2011) and increased odds of lung cancer and respiratory illnesses (Akl et al., 2010).

Consistent with global trends (Akl et al., 2011), the prevalence of hookah use has increased recently among American youth (Cobb, Ward, Maziak, Shihadeh, & Eissenberg, 2010; Sutfin et al., 2011). In a random sample of college students, the lifetime and past 30 day prevalence rates were 41% and 10%, respectively (Primack et al., 2008). The first year of college may be a vulnerable time for hookah initiation due to increased freedoms, permissive social norms, and identity exploration (Arnett, 2005). The transition to college is an important developmental period when risky behaviors, such as alcohol and drug use, tend to increase (Fromme, Corbin, & Kruse, 2008). Furthermore, hookah lounges are frequently located in college towns (Sutfin et al., 2011), and the majority of hookah lounge patrons are under age 21 (Barnett, Curbow, Soule, Tomar, & Thombs, 2011).

Although research has established the prevalence of hookah smoking among college students, several gaps remain. First, all extant studies have used cross-sectional designs, so little is known about how patterns of hookah use change over time, including during the transition to college. Second, there is a dearth of information on the frequency of hookah use, as almost all studies have reported only dichotomous indicators of use (e.g., lifetime and current prevalence). Therefore, the goals of this study were to (a) determine the lifetime and (b) current prevalence of hookah tobacco use, (c) assess the frequency of hookah tobacco use, and (d) assess the pattern of hookah initiation among female students over the first year of college. This research advances the literature by using a longitudinal design with monthly assessments during a key developmental transition and by providing frequency of use data.

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Table 1
Number of days of hookah tobacco smoking in the last month, by wave.

Wave/month	All participants					Hookah users				
	N	Mean	SD	Median	Range	n	Mean	SD	Median	IQ range
1 August	483	2.0	7.0	0	0–100	140	7.0	11.7	3	2–5
2 September	466	0.3	1.7	0	0–25	51	3.1	4.2	2	1–3
3 October	458	0.2	1.0	0	0–10	50	2.1	2.2	1	1–2
4 November	456	0.1	0.7	0	0–10	29	2.0	1.9	1	1–2
5 December	435	0.1	0.6	0	0–7	26	2.0	1.5	1.5	1–2
6 January	441	0.2	1.0	0	0–15	36	2.2	2.8	1	1–2
7 February	441	0.1	0.5	0	0–5	20	2.1	1.3	2	1–3
8 March	427	0.2	0.8	0	0–9	35	2.1	1.9	1	1–3
9 April	411	0.2	0.8	0	0–10	32	2.2	2.1	1	1–3
10 June	402	0.2	0.9	0	0–10	36	2.3	2.0	2	1–3
11 July	390	0.2	0.9	0	0–10	35	2.3	1.9	2	1–4
12 August	400	0.2	1.1	0	0–15	43	2.3	2.6	1	1–2
13 September	424	0.3	1.0	0	0–10	54	2.4	1.9	2	1–3

Note. IQ = Interquartile. *N* for each wave is the number of participants who completed that wave's survey and did not leave the hookah question blank. Wave 1 frequency of use covers lifetime prior to college entry; for waves 2–13, frequency of use covers the last month only. The right-hand panel ("Hookah Users") provides descriptive statistics for only those participants who reported hookah use during that particular wave. Among all participants, the interquartile range is not shown in the table because it was 0–0 for all waves except wave 1, for which it was 0–1.

2. Methods

2.1. Study design and procedure

All procedures were approved by the University's Institutional Review Board. Participants were 483 first-year female college students who participated in a larger 13-month longitudinal study on health behaviors and relationships from August 2009 to August 2010. Participants were recruited via a mass mailing sent to all incoming first-year female students who would be at least 18 years old by the start of the study and were not international students or scholarship athletes (excluded due to postal lags and policies of the National Collegiate Athletic Association, respectively). Campus flyers, word of mouth, and the psychology department participant pool were also used to bolster recruitment; women responding to these methods were screened to ensure eligibility. Interested students signed up on a study website and were invited to brief in-person orientation sessions, during which research staff explained study procedures and obtained written informed consent, and participants completed the baseline survey online. Twelve subsequent monthly surveys were sent out electronically on the last day of the month, and participants had one week to complete them remotely (online). Surveys were linked by unique identification codes, and survey data were stored separately from identifying information. Participants who missed surveys were allowed to resume participation with the next available survey. Participants received \$20 (or 1 h of research credit for those from the participant pool) for the baseline survey, \$10 for each of the next 10 surveys, and \$15 and \$20 for the final two surveys; higher compensation was offered at baseline because that survey was the longest, and for the final two surveys to reduce attrition during the summer months.

2.2. Measures

At baseline, participants were asked demographic information and "before starting college (before August 26, 2009), how many times did you ever smoke hookah?" At each follow-up, participants were asked "during the last month, on how many days did you use hookah to smoke tobacco?" All last-month intervals were specified with anchor dates (e.g., July 1–31) to enhance recall.

We created dichotomous indicators of current (i.e., past 30 days) hookah use for each wave (based on the sample size for that wave; see Table 1) as well as hookah initiation (i.e., trying hookah for the first time ever) during the year-long follow-up. We summed the number of days of hookah use across (a) waves 2–13 and (b) waves

1–13 to obtain the total number of days of hookah use (a) during the year after college entry and (b) lifetime.

We also calculated the cumulative lifetime prevalence of hookah use at each wave. Because the sample size changed at each wave due to participants missing surveys, lifetime prevalence was calculated based on the full sample of 483 participants. We used a conservative approach in that participants who missed one or more surveys and did not report hookah use on any other surveys ($n = 89$, 18%), or who left the hookah question blank on one or more surveys and did not report hookah use on any other surveys ($n = 12$, 2%), were categorized as non-users. Therefore, the reported prevalence may be an underestimate of the actual prevalence. Lastly, we also determined the proportion of participants who initiated hookah tobacco use at each wave, calculated based on the full sample (for consistency in the denominator).³

3. Results

3.1. Sample characteristics

Most participants (94%) were 18 years old at baseline ($M = 18.1$, $SD = 0.3$). Eleven percent were Asian American, 10% Black, 66% White, and 13% other/multiple ethnicities; 9% self-identified as Hispanic. Per university enrollment data, the sample represented 26% of all incoming female students, with an equivalent ethnic breakdown. Sixty-four percent reported their mother had completed college or graduate school.

Most participants (61%) responded to the mass mailing; 28% was from the participant pool, and 11% was recruited through word of mouth or flyers. Participants completed an average of 11.7 surveys ($SD = 2.5$, median = 13); 64% completed all 13 surveys. Response rates for the 12 follow-up surveys were: 97%, 95%, 95%, 91%, 92%, 92%, 89%, 85%, 83%, 81%, 83%, and 88%.

3.2. Lifetime hookah use

Pre-college hookah use was reported by 29% of participants ($n = 140$). During the year after college entry (i.e., waves 2–13), 34% ($n = 164$) reported hookah use. Lifetime prevalence increased slightly

³ The proportion reporting hookah initiation was also calculated based on the number of participants still eligible to initiate hookah use at each wave. The number of participants reporting hookah initiation at each wave was divided by the number of participants who had not reported previous hookah use. Thus, the denominator decreased at each wave as the number of hookah users increased over time. The proportions initiating hookah use from waves 2–13 were: 4.7%, 4.3%, 1.3%, 1.0%, 1.6%, 1.7%, 1.0%, 2.4%, 1.4%, 1.4%, 1.4%, and 2.6%.

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