

Knowledge, Practice, and Attitudes Regarding Hookah (Water Pipe) Smoking among College Students Studying Health Sciences in Riyadh, Saudi Arabia

Fahad Allohidan¹, Ahmed K. Alanazi^{2*}, Mohammed K. Azzahrani²,
Mishaal R. Alrashoud²

¹ Assistant Professor, Psychiatry Consultant, KSAU-HS, NGHA, Riyadh, Saudi Arabia

² College of Medicine, King Saud bin Abdul-Aziz University for Health Sciences, Riyadh, Saudi Arabia

***Corresponding author:** Ahmed Khalaf Alanazi, College of Medicine, King Saud bin Abdul-Aziz University for Health Sciences, Email: alanazi1992a@gmail.com

Abstract:

Objectives: The aims of this study were to estimate the current prevalence and characteristics of hookah smoking among college students in Riyadh, Saudi Arabia, and to assess students' knowledge, attitudes, and beliefs regarding hookah use.

Methods: A cross-sectional, questionnaire-based study was conducted at King Saud bin Abdul-Aziz University for Health Sciences (KSAU-HS) in Riyadh. The study included representative samples from all of the colleges of KSAU-HS.

Results: Of 354 participants, 266 (75.1%) had never tried smoking hookah and only 88 (24.9%) students had smoked hookah during their lifetime. Students who had used hookah included 55 (63%) males and 33 (38%) females. When assessing beliefs and attitudes, we found that 157 (44.4%) believed hookah use to be more socially acceptable than cigarette smoking. Most of the hookah smokers (88.6%) reported that at least one of their five closest friends have ever smoked hookah, whereas only 11.4 reported that none of their closest friends had smoked hookah. Most students strongly agree with the banning of hookah and cigarette smoking by minors and in public areas.

Conclusion: Hookah smoking has become a challenging health concern and is spreading among college students. Students who have used hookah have a higher number of closest friends currently smoking hookah than do non-smoking students, indicating a strong influence of friends on the decision to try hookah. Greater efforts must be put toward educating college students on the risks of hookah smoking to prevent its popularity from growing.

Keywords: Hookah; College Students; Health Sciences; Riyadh; Saudi Arabia.

1. Introduction

Tobacco use is a dangerous, globally widespread habit that can lead to serious health problems. According to the World Health Organization, tobacco use is the most preventable risk factor for non-communicable diseases such as cancers and cardiovascular and pulmonary diseases¹. According to a study conducted in 2007, an estimated five million people die globally due to tobacco

use each year². In developing countries, 80% of deaths before the expected age are due to smoking tobacco¹.

There has been a recent resurgence in the popularity of hookah smoking among teenagers. Hookah is also known as shisha, water pipe, hubble-bubble, narghile, or arghile³. The hookah device consists of a hose, a basin containing water, a pipe, and a head used for tobacco preparation. A hot coal is placed onto the head to heat the tobacco, which is often flavored (apple, grape, mint, etc.). When the hookah smoker inhales through the hose, hot air containing compounds from the tobacco passes through the pipe and is cooled by the water in the basin before being delivered through the hose to the smoker's lungs³.

Many studies have been conducted identifying the effects of hookah on the health of the smoker. Hookah smoke contains hundreds of dangerous substances, including metals, carbon monoxide, and carcinogenic chemicals, which can lead to serious health conditions⁴. Hookah smokers are exposed to three-fold higher levels of carbon monoxide than cigarette smokers⁵. After a 45-minute session of hookah smoking, the heart rate and blood pressure of the smoker increase⁴. Furthermore, people who smoke hookah have an increased risk of developing many types of cancer compared to non-smokers, including pancreatic cancer⁶, prostate cancer⁷, and bladder carcinoma⁸.

A study in the US showed that there has been an increase in the rate of hookah use, especially among teenagers and young adults in high school and universities⁹. Another study, conducted locally in Riyadh, Saudi Arabia, estimated the prevalence of hookah among high school students¹⁰. The study reported 33% of students have tried hookah at least once, and around 10% are current hookah smokers. The aim of the present study was to estimate the prevalence, practice, and attitudes regarding hookah use among KSAU-HS college students in Riyadh, Saudi Arabia.

2. Methods and materials

2.1. Study setting and design

This cross-sectional, questionnaire-based study was conducted at King Saud bin Abdul-Aziz University for Health Sciences (KSAU-HS) in Riyadh, Saudi Arabia. The study sample included students from all colleges of KSAU-HS, including the College of Medicine, College of Dentistry, College of Pharmacy, College of Public Health and Health Informatics, College of Applied Medical Sciences, College of Nursing, and College of Science & Health Professions.

2.2. Population and sampling

At the time of the study, there were 4255 total students enrolled in KSAU-HS, of which 2149 were male and 2106 were female. The necessary representative sample size with 5% margin of error and 95% confidence level was calculated using Raosoft and found to be 354 students¹¹. Quota sampling was used to ensure that all students were represented. **Table 1** shows the proportions of students required from each of the 11 groups, divided by college and gender.

2.3. Data collection and measures

The questionnaire was developed, validated, and used in a previous study on hookah smoking among college students in the US¹². We obtained permission from the developers to modify and use this questionnaire to conduct the present study. The questionnaire contains 44 questions that examine lifetime, current, and future hookah use. Questions regarding attitudes and knowledge about hookah and close friends' current hookah use were also included. Hard copies of the questionnaire were

distributed in empty lecture halls during the break time of the workday after obtaining informed consent from the participants. Each student was given 20 minutes to complete the questionnaire and it was then collected. To conduct the survey in the female colleges, two female students were hired to collect the data, with strict instructions about maintaining confidentiality.

2.4. Data entry and analysis

All questions in the questionnaire were coded and entered into the statistical package for social sciences (SPSS) version 22. Descriptive statistics were calculated for each measure and reported using frequency distributions and proportions.

3. Results

3.1. Prevalence

Of the 354 students who completed the questionnaire, 266 (75.1%) students reported that they had never tried smoking tobacco using a hookah while only 88 (24.9%) students had tried it in the past. Out of the 88 students who had ever used hookah, 55 (62.5%) were males and 33 (37.5%) were females. Among those who had never used hookah, only 14 (5.2%) students reported that they think they would try it soon, whereas 252 (94.7%) reported that they would not. A total of 163 (46%) students reported that they have been to a hookah lounge/restaurant in the past. A far larger percentage of hookah smokers reported smoking cigarettes (30.7%) than did those who had not used hookah (1.1%).

For the group of students reporting they had smoked hookah, we assessed how many of their five closest friends also use hookah (**Figure 1a**). The most common response was that all five of their closest friends smoke hookah (44.3%). Of the remaining smokers, 18.2% have three of their five closest friends who smoke hookah, 13.6% have four, 10.2% have two, and 2.3% have one. The percent of students reporting that they smoke hookah but none of their closest friends smoke was 11.4%.

The same assessment was performed for the group who have never used hookah (**Figure 1b**). In this group, 38.3% reported that none of their five closest friends smoke hookah. Of the non-smokers who did report that some of their five closest friends smoke hookah, 20.3% have two friends who smoke, 16.5% have one, 11.7% have three, and 7.1% report that all five of their closest friends smoke hookah.

3.2. Knowledge, attitude, and beliefs

Most students strongly support banning hookah use by minors under the age of 18 (212; 59.9%), while 60 (16.9%) students strongly oppose such a ban. In addition, 171 (48.3%) students strongly support a ban of hookah smoking in lounges and restaurants, and 72 (20.3%) somewhat support this. **Table 2** shows the attitudes of students toward prohibition of hookah and cigarette smoking among minors and in lounges/restaurants.

When students were asked to compare smoking hookah to smoking cigarettes, 134 (37.9%) believed that hookah use is equally addictive, 167 (47.2%) believed that hookah use is more likely to cause cancer, 177 (50%) believed that hookah use is more harmful, and 191 (54%) believed that hookah use is more harmful over long-term use (**Table 3**). Regarding harmful components in hookah smoke compared to cigarette smoke, 195 (55.1%) believed that hookah smoke contains more nicotine,

172 (48.6%) believed that hookah smoke contains more tar, and 166 (46.9%) believed that hookah smoke contains more carcinogens. Moreover, 160 (45.2%) considered second-hand hookah smoke equivalent to second-hand cigarette smoke and 185 (52.3%) considered hookah use by pregnant females more harmful for the fetus than cigarette smoking. Interestingly, 157 (44.4%) reported that hookah use is more socially acceptable than cigarette use (**Figure 2**). When students were asked about the change in health risk if a smoker were to switch from cigarette use to hookah use, the majority (215; 60.7%) expected no reduction in risk. Of the remaining participants, 54 (15.3%) expected a small reduction, 33 (9.3%) expected a moderate reduction in risk, and 52 (14.7%) expected a large reduction in risk.

3.3. Practice

The 88 students who are current or previous hookah smokers were asked about their hookah practice. Regarding the total number of times used, 27 (30.7%) students reported they had used hookah more than 51 times (**Supplementary Table S1**). In the past month, 30 (34.1%) students reported they had not smoked any hookah, followed by 22 (25%) who reported the use of 1–2 bowls. Regarding the overall frequency of use, 44 (50%) students reported use once each year but not monthly, followed by 18 (20.5%) who reported use once each month but not weekly. Many of these 88 students (31; 35.2%) reported that they had first tried hookah when they were 17–18 years old.

Many students reported that they plan to quit smoking hookah at some point. When asked about intention to quit and confidence that they could quit, 59 (67%) students reported that they are very confident that they will quit, and 37 (42%) reported they plan to quit in the future but not soon (**Supplementary Table S2**). In addition, 66 (75%) reported that they are not hooked on smoking tobacco with hookah whereas 22 (25%) reported they are. During use, 26 (29.5%) participants reported that they sometimes inhale hookah smoke and 25 (28.4%) reported that they always inhale.

Assessment of the environment in which the participants usually use hookah (**Table 4**) showed that 49 (55.7%) students never smoke alone, 47 (53.4%) students always smoke with their friends, and 66 (75%) students never smoke with their families. In addition, 29 (33%) students rarely use hookah in lounges/restaurants, 61 (69.3%) students never smoke at their houses, and 39 (44.3%) reported they never use hookah at their friends' houses.

4. Discussion

Because hookah use is spreading among college students⁴, it is important to examine the reasons for and characteristics of hookah use in this age group. This study was conducted among a sample of all college students of King Saud bin Abdul-Aziz University for Health Sciences (KSAU-HS) in Riyadh. The results show that one-quarter (88; 24.9%) of the students had smoked hookah at least once during their life, and 58 (16.4%) were current smokers who reported the use of hookah during the past month. The importance of this study is not only its measurement of the prevalence and practice of hookah use, but also the comprehensive examination of the knowledge, attitudes, and beliefs toward hookah use among health science students who will become health care practitioners in the future.

One purpose of this study was to examine the prevalence and characteristics of hookah use among the youth in Saudi Arabia. A study performed in 2010 on smoking prevalence in medical colleges in the eastern region of Saudi Arabia found that 8.6% of students reported smoking only

hookah and 12.6% reported smoking hookah and cigarettes¹³, which is similar to our results of 7.6% and 17.2%, respectively. The slight difference in total hookah smokers between the previous study (21.2%) and ours (24.9%) could reflect the spread of hookah use among college students in the six years that elapsed between the two studies. Another study of high school students in Riyadh, Saudi Arabia showed that 33.0% had tried smoking hookah¹⁰. Of the smokers, 273 (65.9%) were male and 141 (34.1%) were female, similar to our results of 62.5% males and 37.5% females. Therefore, the prevalence seems to be higher among high school students than it is among college students in the health sciences, but the distribution by gender is approximately the same. These findings indicate that males are more influenced toward this habit than females.

Some of the influence toward smoking hookah seems to be from peer pressure. A study conducted among college students in the US¹² showed that 25.2% report that none of their closest friends had used hookah, whereas the majority (74.8%) have at least one close friend who uses hookah. We found that only 31.6% report that none of their five closest friends had used hookah and 68.4% have at least one closest friend who had used hookah. Our results almost show the same percentages, and both studies support the effect of college students' close friends on their use of hookah.

The other aspect of this study was the assessment of attitudes, knowledge, and beliefs of college students toward hookah smoking, and to compare them to those toward cigarette smoking. One possible reason for the growth in hookah use is that users perceive it as relatively safe. However, our findings showed that 50% of participants think that hookah is more harmful than cigarette smoking, and 54% think hookah is more harmful over long-term use. A study performed at prominent universities in Jordan⁶ showed that the majority (62.2%) of Jordanian college students believe that hookah smoking is more harmful than cigarette smoking, and only 9.8% believe that cigarettes are more harmful. These findings indicate that, despite the high prevalence of hookah use among young adults, college students are aware of the risks of using hookah. When we assessed the social acceptability of smoking hookah compared to cigarettes, 44.4% reported that hookah smoking is more socially acceptable than cigarette smoking and 34.2% think that both are equally socially acceptable, while only 21.5% think that hookah is less socially acceptable. Among a diverse group of students at a large US university, 50% think hookah smoking is more socially acceptable than cigarette smoking, 34.7% think that both are equally socially acceptable, and only 15.3% think that hookah is less socially acceptable¹². It appears that in many countries, the use of tobacco with a hookah is considered more acceptable than cigarette smoking, which may be one of the reasons for the trend of increasing hookah use among students.

Of the current hookah users surveyed, 53.4% reported that they always smoke hookah with their friends, 1.1% reported that they always smoke alone, and no participants reported that they always smoke with family. These findings are somewhat consistent with those in a study conducted in Syria¹⁴. In the Syrian study, 80.2% reported hookah smoking with friends, followed by 18.6% who reported smoking with family, and only 1.1% reported that they usually smoke alone. Both studies reinforce the effect of friends on the use of hookah. In our study, the students reported less hookah use with their families, which could indicate greater awareness among the families of the risks of using hookah, or less social acceptability among family members who belong to other age groups.

This study has several limitations. The survey was conducted at a single university, and while participants were representative of males and females from all of the colleges at this university, the results may not be applicable to other Saudi universities or those in other countries. In the future, this survey should be repeated at other universities to better understand hookah use among college students. In addition, the nature of this university may have influenced the results. KSAU-HS is a health science university, and therefore its students may be more aware of the risk of health problems associated with

tobacco use. This could strongly affect both the prevalence and the attitudes and beliefs of this group, causing them to differ from those of the population in general. Among students who had never tried smoking hookah, only a small number (5.2%) think they will try it soon, which may reflect the increased knowledge of hookah risks in this population, and may also predict a slowing of the spread of hookah use. However, the high prevalence of hookah smoking even among the future health care providers surveyed here indicates that awareness and prevention programs must be developed to reduce the rates of hookah use. This study contributes to a growing body of evidence that hookah use among college students is a serious health concern. This evidence should lead policymakers in Saudi Arabia to better regulate hookah smoking, by controlling factors such as the prices of tobacco and the settings in which hookah use is allowed, to halt the increase in use.

5. Conclusion

Hookah smoking has become one of the most challenging growing health concerns among college students. We found that almost 25% of students had used hookah during their lifetime. The students who had smoked hookah reported that more of their closest friends were current hookah smokers than did non-smokers. These results suggest that friends have a strong effect on college students that can influence them to try using hookah. Most of the students strongly agreed on the banning of hookah and cigarette smoking by minors and in public areas. Awareness and prevention programs and appropriate policies must be implemented to reduce the rates of hookah use among minors and young adults, and thus reduce the disease burden from smoking-related health conditions.

6. Conflict of Interest

The authors have no conflict of interest to declare.

7. Authors' contribution

All authors have contributed to main parts of this study including study design, data collection, data entry and analysis. FA and AA wrote the manuscript; FA reviewed and edited the manuscript. All authors have read and approved the final draft of the manuscript.

8. Acknowledgement

The study team would like to thank Shaden Alanazi, Ziad Al-Shohitan, and Ohoud Al-Baqmi for their contribution during the data collection.

9. Tables and figures

Table 1. Students required from each group for representative sampling.

College	Male			Female		
	Students	Percentage of total students	No. of students needed	Students	Percentage of total students	No. of students needed
COM	566	13.3%	47	247	5.8%	20
COD	105	2.46%	9	54	1.26%	4
COP	62	1.45%	5	26	0.61%	2
CAMS	165	3.87%	14	66	1.55%	6

CON				676	15.88%	56
COSHP	1251	29.46%	104	1037	24.37%	86
Total	2149	50.5%	179	2106	49.5%	174

Numbers of KSAU-HS students were obtained from the Deanship of Admissions and Registration.
 COM: College of Medicine, COD: College of Dentistry, COP: College of Pharmacy, CON: College of Nursing, CAMS: College of Applied Medical Sciences, COSHP: College of Science and Health Professions

Table 2. Attitudes of students toward banning smoking.

	Strongly Oppose	Somewhat Oppose	Somewhat Support	Strongly Support
The ban on minors (<18) smoking cigarettes.	66 (18.6%)	39 (11%)	28 (7.9%)	221 (62.4%)
The ban on smoking cigarettes in a lounge/restaurant.	53 (15%)	56 (15.8%)	56 (15.8%)	189 (53.4%)
The ban on minors (<18) smoking a hookah (shisha).	60 (16.9%)	34 (9.6%)	48 (13.6%)	212 (59.9%)
The ban on smoking a hookah (shisha) in a lounge/restaurant.	53 (15%)	58 (16.4%)	72 (20.3%)	171 (48.3%)

Table 3. Attitudes of students toward hookah use compared to cigarette use.

Compared to smoking cigarettes...	Less	Equal	More
Likelihood of hookah use to cause addiction	120 (33.9%)	134 (37.9%)	100 (28.2%)
Likelihood of hookah use to cause cancer	42 (11.9%)	145 (41%)	167 (47.2%)
Harmfulness of hookah use to your health	34 (9.6%)	143 (40.4%)	177 (50%)
Harmfulness of hookah use to your long-term health	26 (7.3%)	137 (38.7%)	191 (54%)

Social acceptability of hookah use	76 (21.5%)	121 (34.2%)	157 (44.4%)
Quantity of nicotine in hookah smoke	68 (19.2%)	91 (25.7%)	195 (55.1%)
Quantity of tar in hookah smoke	62 (17.5%)	120 (33.9%)	172 (48.6%)
Quantity of carcinogens that hookah smokers are exposed to	46 (13%)	142 (40.1%)	166 (46.9%)
Compared to second-hand cigarette smoke, how harmful is second-hand hookah smoke?	60 (16.9%)	160 (45.2%)	134 (37.9)
Compared to smoking cigarettes while pregnant, how harmful to the fetus is smoking hookah while pregnant?	26 (7.3%)	143 (40.4%)	185 (52.3%)

Table 4. Summary of the environments in which students report smoking hookah.

	Never	Rarely	Sometimes	Always
Smoking hookah alone	49 (55.7%)	20 (22.7%)	18 (20.5%)	1 (1.1%)
Smoking hookah with friends	6 (6.8%)	15 (17%)	20 (22.7%)	47 (53.4%)
Smoking hookah with my family	66 (75%)	12 (13.6%)	10 (11.4%)	0
Smoking hookah in a lounge/restaurant	17 (19.3%)	29 (33%)	32 (36.4%)	10 (11.4%)
Smoking hookah at my house	61 (69.3%)	18 (20.5%)	7 (8%)	2 (2.3%)
Smoking hookah at my friend's houses	39 (44.3%)	13 (14.8%)	29 (33%)	7 (8%)

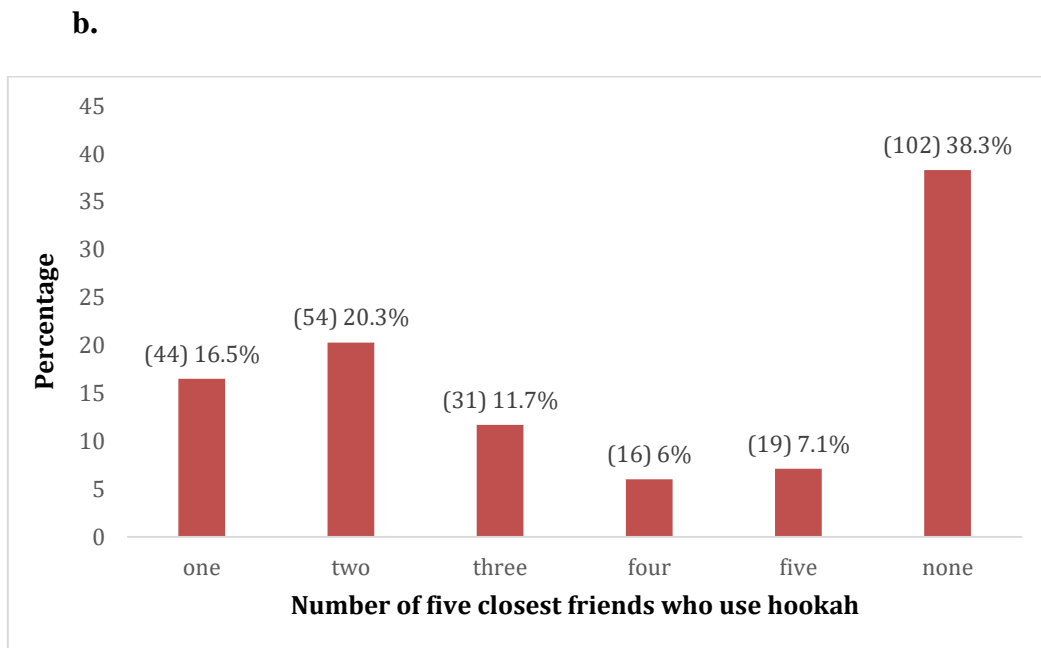
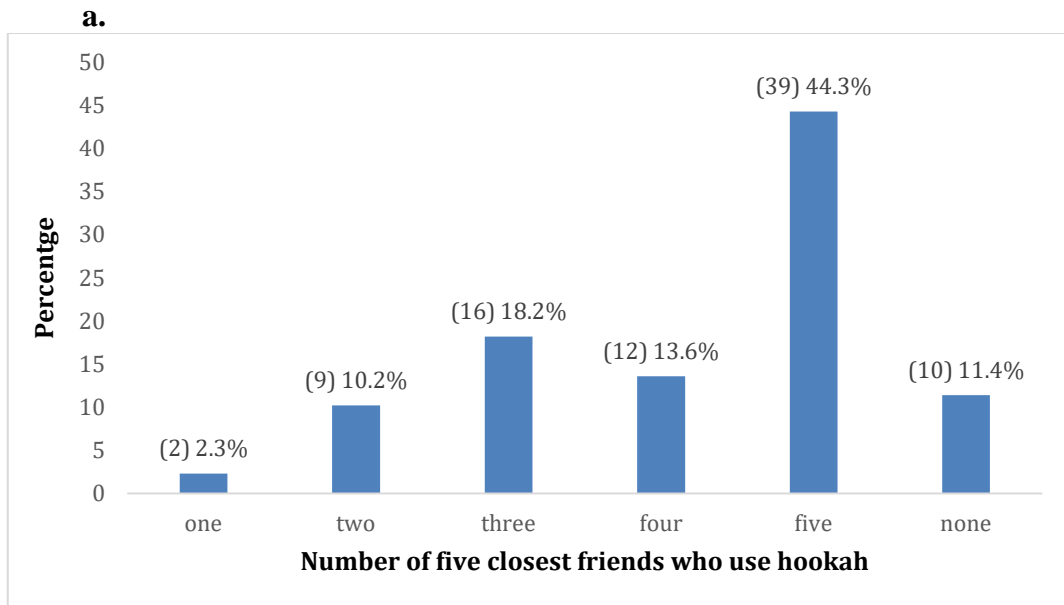


Figure 1. The number of close friends who smoke hookah reported by (a) students who have smoked hookah and (b) students who have never smoked hookah.

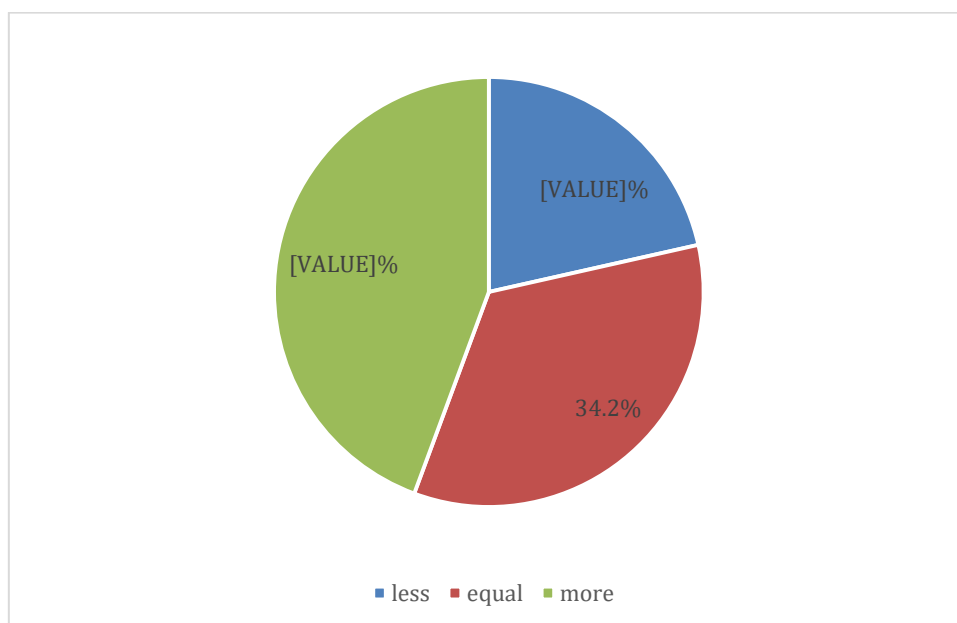


Figure 2. Perceived social acceptability of hookah. Students were asked whether hookah use is more, less, or equally socially acceptable compared to cigarette use.

Supplementary information

Table S1. Frequency and history of hookah use among smokers.

How many times have you smoked a hookah (shisha) in your entire life?							
Response	<1*	1	2–5	6–15	16–25	26–50	>51
% smokers	10.2	4.5	12.5	18.2	12.5	11.4	30.7
How many bowls (of tobacco) did you smoke using a hookah (shisha) in the past month?							
Response	0	1–2	3–5	6–9	10–15	16–20	>21
% smokers	34.1	25	15.9	9.1	6.8	2.3	6.8
How many days did you smoke a hookah (shisha) in the past month?							
Response	0	1–2	3–5	6–9	10–15	16–20	>21
% smokers	38.6	23.9	12.5	8.0	6.8	4.5	5.7
How frequently do you currently use a hookah (shisha) to smoke tobacco?							
Response	Yearly†	Monthly†	Weekly†	Daily†			
% smokers	49.4	20.7	19.5	10.3			
How long have you used a hookah (shisha) at this frequency?							
Response	<0.5 years	0.5–1 years	1–2 years	2–3 years	3–4 years	>4 years	

% smokers	27.6	13.8	23	19.5	6.9	9.2
How old were you when you first smoked a hookah (shisha), or even tried a puff?						
Response	<14 years	15–16 years	17–18 years	19–20 years	21–22 years	>23 years
% smokers	3.4	23.9	35.2	22.7	13.6	1.1

*Respondents smoked one or more puffs, but never a full bowl or session.

†See survey in appendix for exact descriptions of these terms.

Table S2. Attitudes of hookah smokers toward future smoking habits.

How confident are you that you can quit using a hookah (shisha) at any time?				
Response	Not at all	Somewhat	Very	
% smokers	5.7	26.1	67	
Do you intend to quit using a hookah (shisha) at any time?				
Response	Not at all	In the next month	In the next 6 months	In the future
% smokers	27.6	21.8	8	42.5
In 5 years, do you think your use of a hookah (shisha) to smoke tobacco will be:				
Response	Less frequent	About the same	More frequent	
% smokers	57.5	32.2	10.3	
Do you consider yourself “hooked” on smoking tobacco with a hookah (shisha)?				
Response	Yes		No	
% smokers	23		75.9	

References

- [1] WHO report on the global tobacco epidemic, [Internet]; 2015. Available from: http://www.who.int/tobacco/global_report/2015/en/index.html
- [2] Neergaard J, Singh P, Job J, Montgomery S. Waterpipe smoking and nicotine exposure: a review of the current evidence. *Nicotine Tob Res* 2007; 9(10):987-94.
- [3] Jacob P, Abu Raddaha AH, Dempsey D, et al. Comparison of nicotine and carcinogen exposure with water pipe and cigarette smoking. *Cancer Epidemiol Biomarkers Prev* 2013; 22(5):765-72.
- [4] Maziak W. The global epidemic of waterpipe smoking. *Addict Behav* 2011; 36(1-2):1-5.
- [5] Cobb C, Ward KD, Maziak W, Shihadeh AL, Eissenberg T. Waterpipe tobacco smoking: an emerging health crisis in the United States. *Am J Health Behav* 2010;34(3):275–85.
- [6] Azab M, Khabour OF, Alkaraki AK, et al. Water pipe tobacco smoking among university students in Jordan. *Nicotine Tob Res* 2010; 12(6):606–12.
- [7] Hosseini M, Alinaghi S, Mahmoudi M, McFarland W. A case–control study of risk factors for prostate cancer in Iran. *Acta Med Iran* 2010,48(1):61–6.
- [8] Nusrat J, Hamdani S, Burdy G, Khurshid A. Cancer urinary bladder–5 year experience at Cenar, Quetta. *J Ayub Med Coll Abbottabad* 2001, 13(2):14–6.

- [9] Sutfin EL, McCoy TP, Reboussin BA, Wagoner KG, Spangler J, Wolfson M. Prevalence and correlates of waterpipe tobacco smoking by college students in North Carolina. *Drug Alcohol Depend* 2011;115(1-2):131–6.
- [10] Al Moamary MS, Al Ghobain MA, Al Shehri SN, Alfayez AI, Gasmelseed AY, Al-Hajjaj MS. The prevalence and characteristics of water-pipe smoking among high school students in Saudi Arabia. *J Infect Public Health* 2012; 5(2):159-68.
- [11] RaoSoft. Sample size calculator. Available from: <http://www.raosoft.com/samplesize.html>
- [12] Heinz AJ, Giedgowd GE, Crane NA, Veilleux JC, Conrad M, Braun AR, et al. A comprehensive examination of hookah smoking in college students: use patterns and contexts, social norms and attitudes, harm perception, psychological correlates and co-occurring substance use. *Addict Behav* 2013; 38(11):2751-60.
- [13] Taha AZ, et al. Water pipe (shisha) smoking among male students of medical colleges in the eastern region of Saudi Arabia. *Ann Saudi Med* 2010; 30(3):222–226.
- [14] Asfar T, Ward KD, Eissenberg T, Maziak W. Comparison of patterns of use, beliefs, and attitudes related to waterpipe between beginning and established smokers. *BMC Public Health* 2005; 5:11.