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Original Research Article

Social determinants of health and frequency of hookah use among adults in Saudi Arabia: a cross-sectional study

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ABSTRACT

Background: Hookah smoking has become increasingly popular in Saudi Arabia, particularly among young adults. Despite rising prevalence, limited research has investigated how social determinants of health (SDOH) influence the frequency of use in this context. Objective was to examine the relationship between SDOH and the frequency of hookah use among adults in Saudi Arabia.
Methods: A cross-sectional study was conducted from October to December 2023 using an online questionnaire distributed in both Arabic and English. Adults aged 18 and above who reported current hookah use were included. The survey captured demographic characteristics and smoking behaviors. Descriptive statistics, chi-square tests, and ordinal logistic regression were used to analyze the data.
Results: A total of 227 participants completed the survey. Most respondents were Saudi nationals (75.8%), with 54.2% being male. Daily hookah use was reported by 38.8% of participants. Statistically significant associations were found between hookah use frequency and both education level ($p=0.045$) and place of use ($p<0.001$). Home use was most common among daily users, while café use was linked to occasional use. Income, gender, marital status, and employment were not significantly associated with use frequency.
Conclusions: Education level and setting of hookah use significantly influence frequency of smoking in Saudi Arabia. Findings suggest that public health policies should target specific environments and education groups to reduce hookah consumption and its associated health risks.

Keywords: Hookah, Saudi Arabia, Public health, Shisha, Smoking behavior, Social determinants of health, Tobacco control, Waterpipe

INTRODUCTION

Hookah smoking- also known as shisha, nargileh, or water-pipe- is a centuries-old cultural practice in middle eastern, south Asian, and north African regions. Traditionally used in social gatherings, the practice involves heating flavored tobacco using charcoal and inhaling the resulting smoke through a water-filled base and hose. Hookah has long been an integral part of communal rituals of hospitality, conversation, and relaxation across various cultures, particularly in Arab societies.[1]

Over time, this practice has spread globally and evolved from a cultural tradition into a social trend, especially among young adults and college students who view it as a recreational and often harmless activity. In Saudi Arabia, hookah smoking has become increasingly popular, particularly among youth and women. It is commonly practiced in cafés, social events, family gatherings, and estrahas (private recreational spaces). Many perceive hookah to be less dangerous than cigarette smoking due to the water filtration system and the aromatic nature of flavored tobacco. However, growing scientific evidence contradicts this assumption. Studies show that hookah

smoke contains high levels of toxic and carcinogenic substances- including nicotine, carbon monoxide, heavy metals, and tar- even after passing through water.[2]

A typical hookah session can last 45 minutes to an hour and may involve inhaling up to 200 times the smoke volume of a single cigarette. This results in greater exposure to harmful substances and places users at elevated risk of respiratory disease, heart disease, reduced fertility, and cancers of the oral cavity, lungs, and esophagus. Despite these risks, hookah smoking continues to be normalized and even glamorized in some settings. The expansion of hookah cafés, increased availability of flavored tobacco products, and lenient regulation have all contributed to the rise in use. According to the Saudi Ministry of Health, smoking-related illnesses account for over 5,000 deaths annually, and smoking rates remain high, especially among young men. Although Saudi Arabia has made significant strides in anti-smoking efforts, such as introducing high tobacco taxes, banning sales to minors, and restricting smoking in public places, hookah-specific policies are still underdeveloped. Unlike cigarettes, hookah is often excluded from strict enforcement, allowing its widespread use in social and commercial spaces.[6]

While there is growing literature on the prevalence of hookah use in Saudi Arabia, much of it focuses on general usage patterns rather than the social context that drives frequency. Factors such as gender, income, education level, employment status, and place of use (e.g., home versus café) may significantly influence smoking behavior; however, these factors have not been well-explored in local populations. Understanding how these social determinants of health (SDOH) impact the frequency of hookah use is critical for designing culturally relevant interventions and public health strategies.[2]

Although global research has examined the social and demographic factors influencing hookah smoking, localized data from Saudi Arabia remain limited. There is a clear need to bridge this gap with culturally contextualized evidence that can support targeted health policies and interventions.

This study was conducted to fill that gap by investigating the relationship between social determinants of health and the frequency of hookah use among Saudi adults.

Research question

What is the association between social determinants of health (SDOH) and frequency of hookah use among hookah smokers in Saudi Arabia?

Aim of the study

To identify the association between social determinants of health and frequency of hookah use among adults in Saudi Arabia.

Objectives

To identify the frequency of hookah use among hookah users in Saudi Arabia. To identify factors associated with the frequency of hookah use among adults in Saudi Arabia. By addressing these objectives, this study aimed to contribute to the development of effective public health strategies that take into account the cultural, economic, and social factors shaping tobacco use in the region.

Rationale for the study

While global research has explored the social and demographic drivers of hookah smoking, there is relatively little information focused on the Saudi context. Studies from other countries offer valuable insights, but localized research is needed to address cultural and regulatory differences unique to Saudi Arabia. This study aimed to fill that gap by examining how social determinants influence the frequency of hookah use among adults in Saudi Arabia.

METHODS

Study setting and sample

This research was designed as a cross-sectional study (survey-based). The target population is the entire population of Saudi Arabia who smoke hookah.

The inclusion criteria included those who smoke hookah above 18 years old, Saudi and non-Saudi residents.

The exclusion criteria included who didn't smoke hookah, who used vape or e-cigarettes, who smoked cigarettes.

Data were collected between October to December 2023 through an online questionnaire version using Google forms.

Population sample and data collection

According to the World Health Organization (WHO), the prevalence of active smoking is estimated at 17.5% of the entire population of Saudi Arabia (38,000,000). The minimum sample size calculated was 222 participants with a relative estimate of 95% confidence level and 5% margin of error, Sample size was calculated using the formula:

$$n = z^2 \times \hat{p} \times (1 - \hat{p})/e^2$$

Where z is the z score, e is the margin of error, $\hat{p}$ is the population proportion.[8]

The survey was disseminated as an online survey (X, LinkedIn, WhatsApp, and Facebook), in both languages English and Arabic.

Questionnaire design

The survey used was adapted from the previously validated survey and edited to fit the objective of the study. A subject matter expert reviewed the content of the survey to ensure content validity. The questionnaire consists of two sections. The first part included age groups, gender, nationality, marital status, current situation (student, employed, unemployed), monthly income in Saudi Riyal (SAR), and the highest level of education. The second section covers general hookah use and includes nine questions (who influenced you to use hookah, where do you usually use hookah, how often do you use hookah, and did your use of hookah increase after the opening of hookah shops in the city where you live. Hookah usage per day, how long have you been using a hookah, do you think the price of the hookah affects your use, has anyone around you been healthily affected by your use of hookah, and have you felt the harms of using hookah). The main outcome variable was frequency of hookah use, which was classified as daily, weekly, or sometimes. The main independent variables included gender, nationality (Saudi/Non-Saudi), marital status, education level, employment status, monthly income, hookah using place, and inducer to hookah.

Validity and reliability

The survey was pre-tested among 10 individuals who were excluded from the study, and they provided information about the clarity and content of the survey. After preparing the survey as an online form in two languages, Arabic and English, we used an official translation from English to Arabic. We submitted it to a public health expert to achieve content validity. Then the survey was pretested among hookah smokers, and they were asked for feedback.

Ethical consideration

The study was online and voluntary. The participants were able to withdraw at any time. No identifying information was collected to ensure anonymity; ethical approval was awarded by the institutional review board at Al-Faisal University (IRB Log Number: 20260) on November 21, 2023. Participation in this study was voluntary, and participants were allowed to withdraw at any time. No identifiable data was included to ensure anonymity and confidentiality, and all responses were encoded. The data was used for research purposes only.

Data availability

The data was available and can be submitted.

Data analysis

Data were entered and cleaned using Microsoft Excel 365; data management and analysis were conducted through IBM SPSS Statistics for Windows, version 27. Data management included defining and recoding variables. Descriptive data were presented in terms of frequency and percentage for categorical variables. Table 1 shows the demographic characteristics of hookah users, and Table 2 displays questions related to hookah use and influencing factors. To explore the association between demographic characteristics and the frequency of hookah use, we performed a Crosstab test (Chi-square, the results of which are presented in Table 3. For the multivariate analysis, an ordinal logistic regression model was used to adjust for confounding variables and identify significant associations between demographic characteristics and the frequency of hookah use. The results, presented in Table 4, utilize the odds ratio to illustrate the association. A significant association was determined based on a p value of less than 0.05, with 95% confidence intervals.

RESULTS

Characterization of the sample

A survey was completed by 227 participants, of which 123 (54.2%) were men and 172 (75.8%) were Saudi nationals. Findings indicated that 149 (65.6%) were single, and about (69.6%) held a bachelor's or higher degree. Employment status varied, with (50.2%) of the participants employed, (32.4%) being students, and (17.6%) unemployed. In terms of income, 61 individuals (26.9%) reported no income, (78, 34.4%) earned below 10,000 SAR monthly, and (88, 38.8%) earned above this threshold.

Table 1: Descriptive characteristics (n=227).

Variables	N (%)
Gender	
Male	123 (54.2)
Female	104 (45.8)
Nationality	
Saudi	172 (75.8)
Non-Saudi	55 (24.2)
Marital status	
Single	149 (65.6)
Married	78 (34.4)
Education level	
High school and/or diploma	69 (30.4)
Bachelor's degree	127 (55.9)
Post-graduate degree	31 (13.7)
Employment status	
Student	73 (32.2)
Unemployed	40 (17.6)
Employed	114 (50.2)
Monthly income	
No income	61 (26.9)
<10,000	78 (34.4)
10,000-14,999	39 (17.2)
15,000-19,999	20 (8.8)
≥20,000	29 (12.8)

Hookah use and influencing factors

In terms of hookah usage locations, (81, 35.7%) reported using it at home, making it the most common setting, followed by coffee shops (78, 34.4%) and other places with friends (68, 30%). Influences on the initiation of hookah smoking were primarily family and friends for 139 (61.2%) participants, whereas 18 (7.9%) cited their work environment, and 70 (30.8%) based it on personal decision (responded 'myself').

Table 2: Hookah use and influencing factors (n=227).

Variable	N (%)
Where do you mostly use hookah?	
Home	81 (35.7)
Coffee shops	78 (34.4)
Friends place	68 (30.0)
Who influenced you to use hookah?	
Family and/or friends	139 (61.2)
Work environment	18 (7.9)
Myself	70 (30.8)
How often do you use hookah?	
Daily	88 (38.8)
Weekly	41 (18.1)
Sometimes	98 (43.2)
Hookah daily usage	
I don't use hookah every day	106 (46.7)
One hookah	70 (30.8)
Two hookahs	37 (16.3)
More than two hookahs	14 (6.2)
How long have you been using hookah?	
Less than 1 year	41 (18.1)
Between 1-5 years	85 (37.4)
More than 5 years	101 (44.5)
Do you think the price of the hookah affects your use?	
Agree	105 (46.3)
Disagree	56 (24.7)
Neutral	66 (29.3)
Did your use of hookah increase after the opening of hookah shops in the city where you live?	
No	137 (60.4)
Yes	90 (39.6)
Has anyone around you have been healthily affected by your use of hookah?	
No	178 (78.4)
Yes	49 (21.6)
Have you felt the harms of using hookah?	
No	126 (55.5)
Yes	101 (44.5)

The responses regarding the frequency of hookah use were categorized into three groups: daily users (88 individuals, representing 38.8% of total users), weekly users (41 individuals, approximately 18.1%), and social (sometimes) users (98 individuals, 43.2%), with the latter representing the largest proportion of users. The duration of hookah use among participants varied, with 41 individuals (18.1%) using hookah for less than one year, 85 individuals (37.4%) for (1 to 5 years), and 101 individuals (44.5%) for more than five years.

Concerning the impact of hookah pricing on usage patterns, 105 participants (46.3%) agreed that the price of hookah affects their frequency and patterns of use, while 65 participants (28.6%) disagreed, indicating that price does not impact their use. Sixty-six participants (29.1%) had a neutral stance on the impact of price on hookah usage patterns. In terms of changes in hookah use following the opening of local hookah shops, more than half of the participants (137, 60.4%) reported no change in their hookah use habits, while 90 participants (39.6%) indicated a change in their usage patterns influenced by the opening of these shops.

Regarding the potentially harmful effects of hookah use, 178 participants (78.4%) and 126 participants (55.5%) did not perceive any harmful effects on people around them (secondhand effects) or on themselves, respectively. Conversely, 49 participants (21.6%) and 101 participants (44.5%) acknowledged harmful effects on others and themselves, respectively.

The association between the demographics properties and the frequency of using hookah

This investigation focused on the patterns of hookah smoking among individuals, analyzing the association between demographic characteristics and the frequency of hookah use- daily, weekly, and sometimes (intermittent or social smoking). The study utilized the chi-square test (Table 3) to examine variables including gender, age, nationality, marital status, education level, employment status, monthly income, preferred places of use, and inducers of smoking. The table shows a nearly balanced distribution of daily hookah smoking, with 35% of males compared to 43.3% of females. Intermittent hookah smoking was more common among males (48.7%) than females (36.5%); however, this difference was not statistically significant (p=0.18).

The 18-25 age group was the most represented. However, age did not significantly influence hookah smoking frequency (p=0.46). Although many participants were Saudi nationals, nationality did not significantly affect the frequency of hookah use (p=0.51). Participants with a bachelor's degree were the most frequent users across all categories. A significant relationship was found between education level and hookah use frequency (p=0.045), indicating that individuals with higher educational qualifications showed different usage patterns compared to those with lower qualifications. Despite many hookah smokers being employed, employment status did not significantly impact the frequency of hookah usage (p=0.60). The financial status of participants did not significantly influence the frequency of hookah usage (p=0.31).

Table 3: Association between the demographic properties and the frequency of hookah use.

Variables	Frequency of hookah use N (%)			P value
	Daily	Weekly	Sometimes	
	88 (38.8)	41 (18.1)	98 (43.2)	
Gender				
Male	43 (35.0)	20 (16.3)	60 (48.7)	0.18
Female	45 (43.3)	21 (20.2)	38 (36.5)	
Age in years				
18-25	38 (42.2)	14 (15.6)	38 (42.2)	0.46
26-33	20 (28.2)	14 (19.7)	37 (52.1)	
34-41	19 (50.0)	7 (18.4)	12 (31.6)	
42-49	6 (42.9)	2 (14.2)	6 (42.9)	
≥50	5 (35.7)	4 (28.6)	5 (35.7)	
Nationality				
Saudi	70 (40.7)	29 (16.9)	73 (42.4)	0.51
Non-Saudi	18 (32.7)	12 (21.8)	25 (45.5)	
Marital status				
Single	55 (36.9)	25 (16.8)	69 (46.3)	0.41
Married	33 (42.3)	16 (20.5)	29 (37.2)	
Education level				
High school and/or diploma	28 (40.6)	10 (14.5)	31 (44.9)	0.045
Bachelor's degree	54 (42.6)	20 (15.7)	53 (41.7)	
Post-graduate degree	6 (19.4)	11 (35.4)	14 (45.2)	
Employment status				
Student	31 (42.5)	11 (15.0)	31 (42.5)	0.60
Unemployed	17 (42.5)	5 (12.5)	18 (45.0)	
Employed	40 (35.1)	25 (21.9)	49 (43.0)	
Monthly income				
No income	24 (39.3)	7 (11.5)	30 (49.2)	0.31
<10,000	24 (30.8)	15 (19.2)	39 (50.0)	
10,000-14,999	17 (43.6)	8 (20.5)	14 (35.9)	
15,000-19,999	8 (40.0)	4 (20.0)	8 (40.0)	
≥20,000	15 (51.8)	7 (24.1)	7 (24.1)	
Hookah using places				
Home	49 (60.5)	10 (12.3)	22 (27.2)	<0.001
Coffee shops	14 (17.9)	23 (29.5)	41 (52.6)	
Friends place	25 (36.8)	8 (11.8)	35 (51.4)	

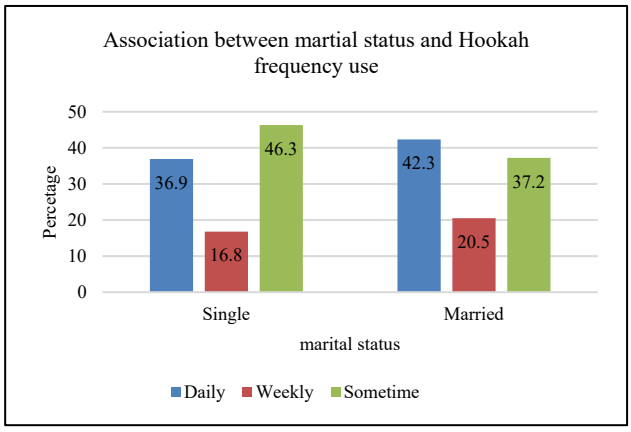

Figure 1: Association between marital status and hookah frequency use.

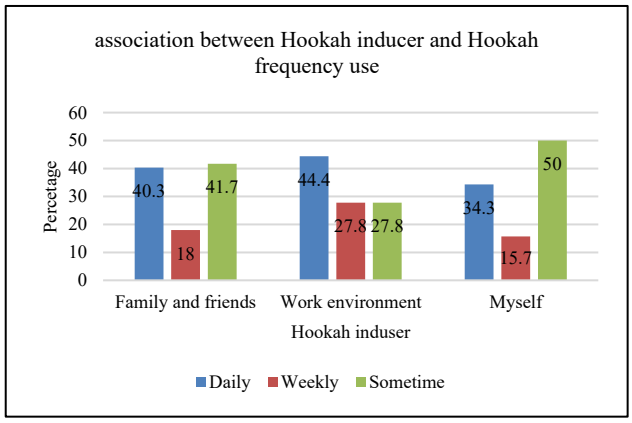

Figure 2: Association between hookah inducer and hookah frequency use.

The location of hookah use varied significantly with frequency; daily users predominantly smoked at home (60.5%), while intermittent or social smokers preferred coffee shops (52.6%). This indicates a strong, significant effect of the place of use on hookah smoking frequency (p<0.001). These findings demonstrate that while certain demographic characteristics, such as education level and places of hookah use, significantly influence the smoking frequency, other social determinants of health, like gender, age, nationality, marital status, employment status, and monthly income, do not have an effect.

Figure 1 illustrates the relationship between marital status and the frequency of hookah consumption. Intermittent hookah use was more common among single participants (46.3%) compared to daily consumption (36.9%). In contrast, daily consumption was more prevalent among married participants (42.3%) compared to intermittent use (37.2%). However, this difference did not show a statistically significant association (p=0.41).

Figure 2 illustrates the relationship between hookah inducers, such as the work environment, family and friends, or the smokers themselves, and the frequency of consumption. Work pressure and the environment were the primary factors influencing daily hookah smoking (44.4%), whereas intermittent smoking was more commonly associated with family and friends (41.7%) or initiated by the smoker themselves (50%). However, these influences did not have a significant effect on the frequency of hookah use (p=0.47).

Table 4: Ordinal logistic regression of the frequency of using hookah.

Variables	B	SE	Frequency of using hookah (daily, weekly, sometime)		P value
			OR	95% CI for OR	
Gender					
Male			1	Ref.	
Female	-0.37	0.29	0.69	(0.39-1.21)	0.20
Age in years					
18-25	-	-	1	Ref.	
26-33	0.48	0.44	1.62	(0.68-3.88)	0.28
34-41	-0.16	0.59	0.85	(0.27-2.69)	0.79
42-49	0.40	0.71	1.50	(0.37-6.01)	0.57
≥ 50	0.70	0.76	2.02	(0.45-9.04)	0.36
Nationality					
Non-Saudi	-	-	1	Ref.	
Saudi	-0.39	0.32	0.68	(0.36-1.27)	0.22
Marital status					
Single	-	-	1	Ref.	
Married	-0.17	0.37	0.85	(0.41-1.77)	0.66
Education level					
High school and/or diploma	-	-	1	Ref.	
Bachelor's degree	0.06	0.70	1.06	(0.56-2.01)	0.87
Post-graduate degree	0.33	0.54	2.01	(0.70-5.74)	0.19
Employment status					
Student	-	-	1	Ref.	
Unemployed	0.58	0.54	1.78	(0.61-5.17)	0.29
Employed	0.51	0.51	1.66	(0.61-4.47)	0.32
Monthly income					
No income	-	-	1	Ref.	
<10,000	0.02	0.41	1.02	(0.46-2.25)	0.97
10,000-14,999	-0.97	0.54	0.38	(0.13-1.09)	0.07
15,000-19,999	-0.65	0.65	0.52	(0.15-1.85)	0.31
≥20,000	-1.63	0.63	0.20	(0.60-0.68)	0.01
Hookah using places					
Home	-	-	1	Ref.	
Coffee shops	1.4	0.35	4.06	(2.03-8.14)	<0.001
Friends places	1	0.34	2.72	(1.39-5.34)	0.004

Ordinal logistic regression between the demographic factors and the frequency of using hookah

Ordinal logistic regression analysis was conducted to examine the association between the frequency of hookah use and significant factors such as education level and hookah use locations while controlling for other factors, including age, gender, monthly income, nationality, marital status, and employment status (Table 4). The reference category for the dependent variable was set to "sometimes" for the frequency of hookah use. The findings indicate that the education level does not significantly affect the frequency of hookah smoking. However, individuals with a high monthly income of more than 20,000 SAR are 80% less likely to smoke hookah socially compared with individuals who have no monthly income (OR=0.20, p value =0.01). Moreover, those who use hookah at coffee shops were 4.06 times more likely to use hookah occasionally (sometimes) as compared to those who use it at home (OR=4.06, p value <0.001). Similarly, those who smoke hookah accompanied by their friends were 2.72 times more likely to smoke hookah socially (sometimes) compared with home users (OR=2.72, p value =0.004). Overall, the variables mentioned account for approximately 9.5% of the variance in the frequency of hookah use (R^2=0.095).

DISCUSSION

This study offers a closer look at who is using hookah in Saudi Arabia and how often. Many participants-especially those with high school or bachelor's degrees-reported daily use, with home being the most common setting. This supports earlier studies in Sudan and Libya showing that people with less education are more likely to be frequent users.[2,10]

Social influence played a major role. Friends and family were key reasons why many participants began smoking, a trend also seen in studies from South Asia and the Gulf. Despite knowing the health risks, many still picked up the habit through close social circles.[1,5,6]

Cost mattered too. People with lower incomes were more likely to say that the price of hookah affects how often they smoke, especially in public places like cafés. Other research supports this- raising tobacco prices through taxes often helps reduce smoking rates. For higher-income users, however, price appeared to have little effect.[1,4,15]

Gender differences were also clear. While overall use didn't differ much between men and women, where they smoked did. Women were more likely to use hookah at home, likely due to cultural expectations and privacy concerns. Men tended to smoke more in public or social settings. These patterns mirror findings from other studies, such as those showing how family dynamics and social norms shape women's hookah habits.[2]

These insights suggest that public health efforts must do more than raise awareness. Campaigns need to be tailored by gender, setting, and income level. For example, messages that resonate with young women may need to focus on social pressures and home use, while messages for men could target social environments like cafés. Taxation, regulation of hookah venues, and targeted education in schools and communities are all key tools.

Of course, the study has limitations. The cross-sectional nature limits any causal inferences and introduces recall bias. Also, most participants were under 41 years old, which introduces selection bias and limits generalizability. Still, the findings give valuable insights into current trends and behaviors of smoking Shisha in Saudi Arabia.

CONCLUSION

Hookah smoking is common among Saudi adults, especially those with less education and among women who smoke at home. Higher-income individuals were more likely to be frequent users rather than occasional ones. These patterns reflect broader social and economic realities, where gender norms, income, and environment shape tobacco habits. Future policies should respond with nuanced, community-aware interventions that address affordability, accessibility, and social influence.

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Ethical approval: The study was approved by the Institutional Ethics Committee Al-Faisal University (IRB Log Number: 20260) on November 21, 2023

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