

Sociocultural and Demographic Predictors of Hookah Smoking Behavior in the Eastern Province of Saudi Arabia

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Abstract

Background. The prevalence of hookah smoking in Saudi Arabia is rising, particularly among young adults. In response to this public health concern, the Saudi government implemented a 100% tobacco excise tax and altered hookah lounge licensing regulations in 2019. However, the sociocultural and demographic factors influencing smoking behavior remain understudied.

Aim. This study aimed to assess the relationship between hookah lounge availability, taxation, and smoking behavior, and to explore how demographic and social factors such as gender, age, income, and peer influence affect hookah consumption in the Eastern Province of Saudi Arabia.

Methods. A cross-sectional, internet-based survey was conducted from February to March 2020 among 1,670 adults residing in the Eastern Province. The survey, based on validated tools, included questions on smoking status, preferred tools, social influence, lounge availability, and income. Descriptive statistical tests were performed using SPSS with a $P < 0.05$ was considered statistically significant.

Results. Out of 1,670 participants, 30% were smokers, the majority of whom were males (69%) and aged 21-30 years (46%). A significant association was found between smoking status and hookah lounge availability ($P < 0.001$). While the 100% tax led to reduced lounge visits ($P = 0.002$), it did not significantly change overall smoking rates (71% reported no change in behavior). Social influence was strongly associated with smoking, with 84% of smokers reporting increased desire to smoke in the presence of peers. The monthly income level was significantly associated with lounge visitation patterns ($P = 0.008$), but not with perceived financial impact ($P = 0.203$).

Conclusion. Social acceptance and peer environments are major drivers of hookah use in Saudi Arabia. Although taxation reduced public smoking settings, it did not alter overall consumption. Effective tobacco control must extend beyond economic measures to address sociocultural determinants through peer-led, education-based, and zoning-specific interventions.

Keywords. Tobacco, Tax, Consumption, Hookah, Lounges, Smoking habits.

Introduction

Globally, tobacco use continues to pose a significant public health challenge, with smoking-related morbidity and mortality increasing particularly in low- and middle-income countries, including those in the Middle East (1, 2). In Saudi Arabia, recent epidemiological reports have shown that tobacco consumption patterns are evolving, with a noticeable shift from traditional cigarettes to alternative forms such as waterpipe smoking (hookah) (3-5). The rise in hookah use is particularly

concerning due to misconceptions about its safety, despite evidence that it may expose users to higher levels of toxicants than cigarette smoking(3, 6, 7).

Hookah smoking is notably prevalent among young adults and has become embedded in certain sociocultural practices in the region, often perceived as more socially acceptable and less addictive(8-10). Social influence, including peer pressure and perceived norms, is a powerful predictor of smoking initiation and maintenance, particularly among youth and young adults(11, 12). Studies in Middle East countries have consistently found that individuals who are surrounded by smokers, such as peers and family members, are more likely to become regular smokers themselves (13-15).Female smoking, while traditionally underreported, is rising amid shifting societal values and urbanization(16, 17).

Gender and age differences further shape tobacco use behaviors. In Saudi Arabia, men consistently report higher smoking prevalence than women, but social shifts and increasing accessibility of hookah lounges are altering these patterns(18). Younger individuals, particularly those aged between 18 and 30, are more susceptible to adopting smoking behaviors due to both social influence and targeted marketing strategies(19). Furthermore, cultural permissiveness plays a critical role in reinforcing smoking behavior; when smoking is perceived as socially acceptable, especially in male-dominated gatherings or leisure venues, the likelihood of smoking increases substantially(20, 21).

Although the Saudi Ministry of Commerce implemented a 100% tobacco excise tax in 2019 aimed at curbing tobacco use, the impact on actual smoking behavior appears to be uneven(22). This intervention must be complemented with behavioral and cultural interventions that address the underlying social determinants of smoking. Therefore, this study builds upon these insights by evaluating the sociocultural and demographic predictors of hookah smoking behavior in the Eastern Province of Saudi Arabia. Specifically, this study aims to investigate how sex, age, income, peer influence, and social acceptance correlate with hookah smoking prevalence and consumption patterns. Understanding these factors is essential for designing tailored, context-specific public health interventions that address not only economic but also cultural drivers of tobacco use.

2. Materials and Methods

2.1. Study Design

A cross-sectional, descriptive online survey was conducted from February to March 2020 to assess the association between hookah lounges accessibility and current smoking habits in Saudi Arabia.

2.2. Study population and Sample size

The study population consisted of Arabic or English-speaking individuals and reside in the Eastern Region in Saudi Arabia. A convenient sampling method was used in this survey to attract respondents from a large geographical area and facilitate the recruitment of a large sample.

The estimated population of the Eastern Province of Saudi Arabia was set to be 4,9 million (23). The sample size was calculated using the Raosoft formula to estimate the prevalence with 95 % confidence interval and 5 % margin of error. The final adjusted sample size was $(280 / (1 - 0.10) = 280 / 0.90 = 311)$, allowing for a nonresponse rate of 10 %.Sample size calculation was performed using the online calculator (<https://www.calculator.net/sample-size-calculator.html>). The calculator estimated that the minimum sample size for this study was 385 participants. With a prediction that there will be a 20% drop rate, the total sample required for this study will be 462 participants (24). The participants were recruited randomly from the general population of the Eastern region.

The inclusion criteria were individuals who aged 18 years to 65 years old and reside in the Eastern Region of Saudi Arabia. Conversely, the exclusion criteria aimed to identify individuals who did not meet the specified criteria for our target population, such as individuals who were aged below 18 years, above 65 years, or located outside the Eastern Region. By excluding these individuals, we aimed to ensure the homogeneity of our study sample and maintain the relevance of the findings to the

specific context under investigation.

2.3. Survey distribution and return

An internet-based survey was distributed to participants anonymously through an internet-based survey site (Google form). Informed consent was collected from each participant prior to participation. The consent form was a separate page, an introductory page to the online survey page. The consent form outlined the purpose of the study, the data collection process, the rights of the participants, and any potential risks or benefits associated with their participation. Participants were required to actively indicate their consent by checking a box or clicking an “I agree” button on the consent form. Confidentiality of participants was maintained throughout the research, and participation was voluntary throughout the study

2.4. Participant identification and recruitment

An invitation e-mail was sent by the researchers through their university e-mail network to potential participants. The e-mail contained an introductory statement about the study with a hyperlink to the web-based survey. WhatsApp® messages were also sent to different groups across Eastern Province. Distribution of the survey link to as many colleagues and friends as possible was requested from other colleagues.

2.5. Survey development

A self-administered validated questionnaire was adapted from the previous studies published in this regard. The study questionnaire was divided into three sections. The first section consists of 14 questions regarding sociodemographic data, availability of hookah lounges, and smoking status. The second section consists of ten questions which asks about smoking patterns, it includes the frequent visit to hookah lounges, smoking tools, smoking place, the effect of taxes on smoking habits, availability of hookah lounge and often of visiting the hookah lounge. The third section consisted of two questions for nonsmokers which include the reasons for being non-smokers and the action taken when being inside a hookah lounge.

2.6. Questionnaire validation

A pilot study was conducted before proceeding with the original study with a sample of ten randomly selected participants. The pilot’s study ensured that the target population understood what each research question is being asked, as well as what each response means. The research team reviewed and discussed ideas raised from the pilot study to make the survey easier for the participants. The reliability of the questionnaire was assessed with Cronbach’s alpha coefficient of 0.7. The Arabic version was validated by asking experts in English/Arabic language to re-check the translated questionnaire and their comments were addressed in the final Arabic version. Then, a sample of five randomly selected participants were asked to evaluate and ensure full understanding of the Arabic version.

2.7. Data management and analysis

Once the survey was closed, data extracted into Microsoft Excel for coding and preparation for statistical analysis. The accuracy of the gathered data will be assessed by visual inspection. As part of the survey design, a mandatory response to all questions was required. Demographic variables will be reported using mean and standard deviation for continuous parametric variables, median/interquartile range for continuous non-parametric variables and number/frequency for binary variables.

2.8. Ethical approval and informed consent

This study was approved by the Institutional Review Board (IRB) at Imam Abdulrahman bin Faisal University (Reference Number IRB-UGS-2020-03-152, Approval Date 10/05/2020). Written informed consent was obtained from all participants in this study. All participants were deidentified.

3. Results

This study included 1670 participants, 61% of them were female individuals (Table 1). 46% of the participants were in the age group 20 – 30 years and 23% were in the age group 31 – 45 years (Table 1). Table 1 presents that 44% of the participants were students, 70% were non-smokers, and 57% were receiving less than 5000 Saudi Riyals as monthly income.

Table 1: characteristics of the included participants (n = 1670)

Characteristics	Number	Percentage (%)	
Gender	Male	655	39
	Female	1015	61
Age(years)	18-20	313	19
	21-30	773	46
	31-45	379	23
	45-65	205	12
Profession	Student	728	44
	Privet / Governmentalemployee	61	4
	Freelancer	303	18
	Unemployed	284	17
	Other	294	17
Smoking status	Smoker	502	30
	Male	346	69
	Female	156	31
	Nonsmoker	1168	70
	Male	309	27
Female	859	73	
Income	Lessthan5000	947	57
	From 5000– 10000	300	18
	More than 10000	423	25

The data shows that 39% of the participants who were smokers preferred to smoke in cafés and restaurants, 21% preferred to smoke at home and 40% preferred to smoke in both (Result not shown). In addition, 65% of the participants who were smokers have no certain preference as they smoke alone or when they are surrounded by smokers. On the other hand, 84% of the smokers' group mentioned that their desire for smoking increases when being surrounded by smokers. 72% of the smokers mentioned that smoking is acceptable or slightly acceptable by their society (Result not shown).

When we asked the participants about the availability of hookah lounge, 54% of the respondents reported a slight available hookah lounge, 34% reported a moderate availability and 13% reported a great availability (Figure 1).

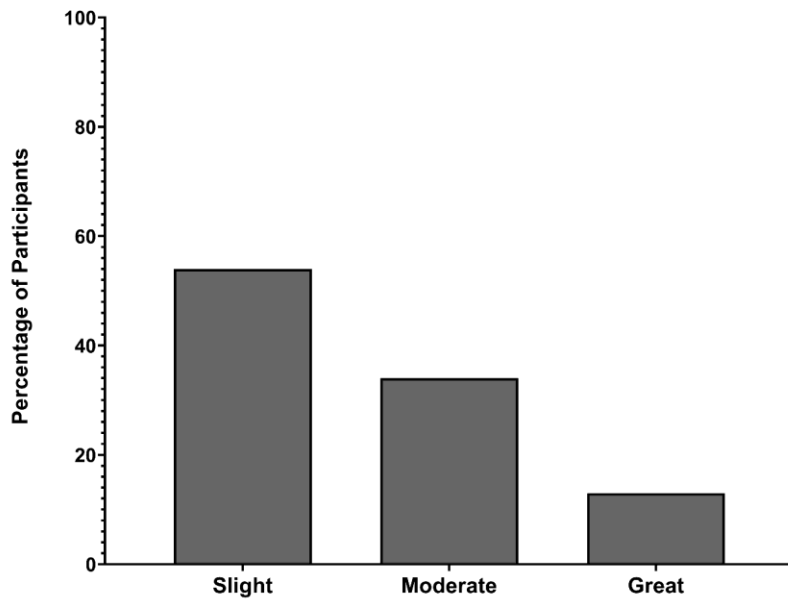


Figure 1: Participants response in reference to the availability of hookah lounge

When asking the smoker respondents about their preferred smoking tool, 61% reported hookah as preferred smoking tool, 45% preferred cigarettes and 20% preferred Vape (Figure 2).

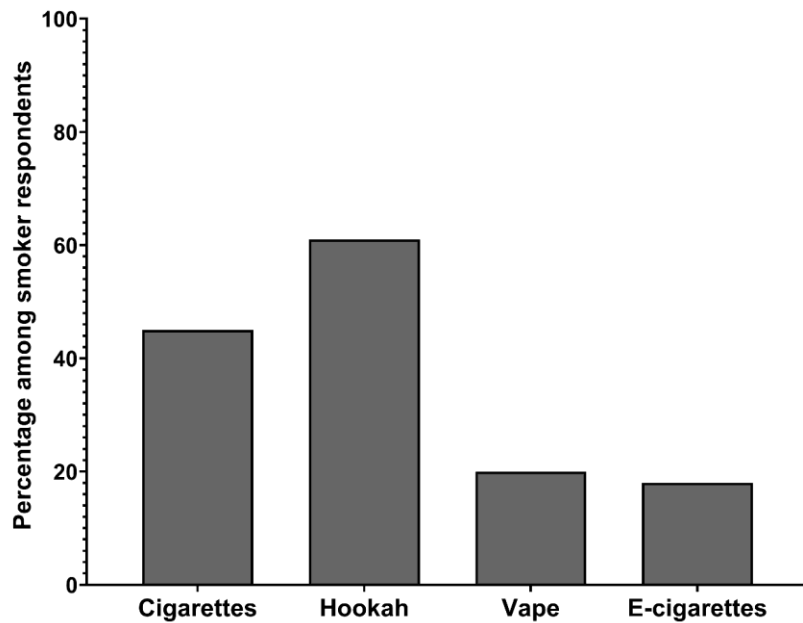


Figure 2: Preferred smoking tool reported by smoker respondents (n = 502). As participants could have chosen more than one option concurrently, they may be included in each selection.

Interestingly, when the non-smoker respondents were asked for the reason abstain them from smoking, 58% of them reported society reasons, such as; rejection and unacceptability, 45% reported worrying from smoking harmful effect, and 15% reported cost as a cause for abstain from smoking (Figure 3).

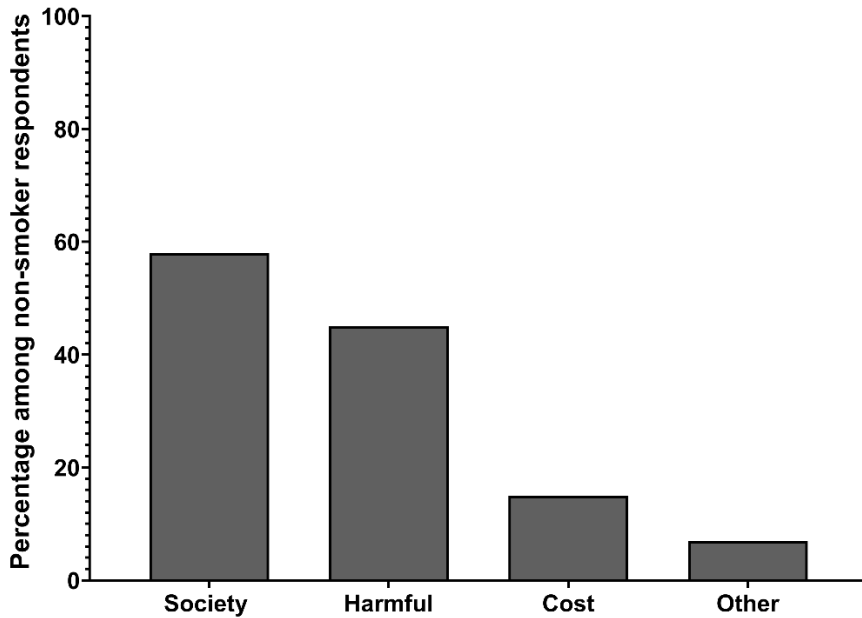


Figure 3: Reasons for non-smokers to abstain from smoking (n = 1168).

Interestingly, further analysis was conducted to determine the effect of hookah smoking on the total monthly income of the participant, and the result revealed no significant difference (P = 0.2) among the respondents (Table 2).

Table 2: The effect of hookah smoking on the participants' monthly income (n = 502).

Income	Smoking impact			Chi-square test	
	Negative impact	No impact	Sometimes	Value	P-value
Less than 5000 Riyals.	90	52	76	5.952	0.203
From 5000–10000 Riyals.	60	25	37		
More than 10000 Riyals.	59	48	55		

Further analysis to assess the participant perception of the effect of hookah lounge availability on the pattern of lounge visits after applying the smoking tax was conducted and the result revealed that tax application results in reduction of hookah lounge visit with both the options either hookah lounges were available or not available in the area (P = 0.002) (Table 3).

Table 3: Participants perception of the effect of hookah lounge availability on the pattern of lounge visits after applying smoking tax.

Availability of hookah lounges	Visit pattern to hookah lounge				Chi-square test	
	Visiting increase	Visiting decreased	Consistent Visits	Refrained to visit	Value	P-value
Available	10%	18%	24%	48%	14.578	0.002
Unavailable	1%	19%	20%	60%		

In addition, further analysis was conducted to assess the effect of the monthly income on hookah lounge visit among smoker respondents. The analysis revealed a strong association between the respondent's monthly income and hookah visit, as the lower the income the less likely the respondent will visit the hookah lounge ($P = 0.008$) (Table 4).

Table 4: The effect of monthly income on hookah lounge visit patterns among smokers (n = 502)

Income	Visit to hookah lounge				Chi-square test	
	last week	Last month	Last year	I never visit	Value	P-value
Less than 5000 Riyals.	29	66	58	65	20.648	0.008
From 5000-10000 Riyals.	32	39	14	39		
More than 10000 Riyals.	47	37	35	41		

4. Discussion

This is the first study to investigate the sociocultural and demographic predictors of hookah smoking behaviour in the Eastern Province of Saudi Arabia. A significant finding from this study is that social context significantly shapes smoking behaviour among Saudi adults, particularly in communal settings. A large proportion of participants who were smokers (84%) indicated that their desire to smoke increases when they are surrounded by other smokers, and 72% reported that smoking is considered acceptable or slightly acceptable in their community. Conversely, 58% of non-smokers reported that society related reasons were the cause for their abstaining. These findings are consistent with regional literature as most hookah smokers in North Iran smoke in groups, often among friends, whereas tobacco and waterpipe use in Saudi university students was strongly associated with the presence of family or peer smokers (11, 13). The social acceptability of hookah, especially in male-dominated gatherings and leisure venues, contributes to its normalization and persistence in young adults' lifestyles (5). This finding highlights the importance of social-context-based interventions, such as peer-led programs, to reduce smoking rates.

Another important finding is that smoking behaviour in Saudi Arabia is disproportionately concentrated among young adult males, with 69% of smokers being male and nearly half aged 21 to 30

years. This finding aligns with national surveys and previous studies that attribute higher male smoking prevalence to both cultural leniency and social dynamics surrounding male leisure activities(21). For example, Albahrani et al. (2025) observed that younger males in the Eastern Province are more likely to smoke both traditional and electronic forms of tobacco compared to their female counterparts(17). Previous reports discussed gender difference as female patients usually reported higher awareness towards their sickness and access the health care system more often compared to male patients (25-27). In addition, this study reported that the majority of smokers held a bachelor's degree, a pattern also reported previous literature, where over half of the smokers had college-level education(28). These findings challenge the assumption that higher education consistently correlates with lower smoking rates in developing contexts. Rather, it suggests that targeted health promotion messages must address young, educated males, particularly in urban areas where hookah lounges are more accessible and culturally normalized.

Although the Saudi Ministry of Commerce implemented a 100% excise tax on tobacco products in 2019, the majority of smokers (71.1%) in the current study reported no change in their smoking habits. However, nearly half noted a decrease in their visits to hookah lounges. This suggests that taxation may influence venue choice rather than reduce overall consumption, reflecting a shift from public to private smoking settings. These findings are supported by another study which reported a significant number of smokers in Saudi Arabia either continued smoking or shifted to cheaper brands post-taxation(22). Globally, evidence shows that while taxation is effective in reducing tobacco use overall, its impact is less pronounced when smoking is socially embedded or when cheaper alternatives or private options remain easily available(2). In the Saudi context, the cultural centrality of smoking as a group activity, particularly in gendersegregated leisure spaces, may buffer against the full deterrent effect of financial disincentives. Public health efforts should therefore consider pairing taxation with environmental restrictions (e.g., zoning regulations on lounges) and culturally tailored behavioural campaigns.

This study found a statistically significant relationship between monthly income and frequency of lounge visitation, as lower-income smokers (<5000 SAR/month) were less likely to visit lounges. However, income level was not significantly associated with total smoking impact, suggesting that while economic factors shape how and where people smoke, they do not necessarily influence whether people smoke. This supports previous findings that price sensitivity affects venue choice and purchasing behaviour more than nicotine dependence itself(2). It was expected that taxation tends to reduce public smoking and product expenditure more effectively in low-income populations, but may not result in cessation without broader behavioural interventions(29). In this study, while taxation reduced lounge attendance among economically constrained individuals, many may have substituted lounge use with home smoking, a behaviour also driven by convenience and cultural norms. This reinforces the need for interventions that target behaviour change in both public and private domains, such as at-home smoking restrictions and community-based cessation programs.

This study offers valuable insights into the behavioural and demographic predictors of hookah smoking in Saudi Arabia, using a large, diverse sample and a rigorously validated bilingual survey. It is one of the few studies to examine the intersection of social norms, income, taxation, and lounge accessibility in a single national context.

However, the findings must be interpreted with consideration of some limitations. The study's cross-sectional design does not allow for causal inferences, and self-reported data may be subject to social desirability bias, particularly among female respondents. The convenience sampling from the Eastern Province also limits generalizability to other regions with differing cultural or regulatory environments.

Despite these limitations, the findings have critical implications for public health practice. First, they highlight the limited power of financial policies alone to reduce smoking without accompanying

interventions that address social and cultural determinants. Second, the results emphasize the need for gender and age-specific education, as well as peer-oriented interventions in universities, workplaces, and recreational spaces. Finally, regulating the density and accessibility of hookah lounges, alongside taxation, may offer a more comprehensive approach to reducing hookah consumption in the Kingdom.

5. Conclusion

This study reveals that hookah smoking behavior in Saudi Arabia is strongly influenced by social norms, peer presence, and demographic factors. While tobacco taxation reduced visits to lounges, it did not significantly affect overall consumption. Lower-income individuals were less likely to visit lounges, but smoking habits persisted across all income levels. These findings suggest that effective tobacco control must go beyond taxation to include culturally tailored behavioral interventions and policies targeting social environments.

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Conflict of interest

The authors have no potential conflicts of interest that might be relevant to the contents of this manuscript.

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Ethical approval and informed consent

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Data availability

The datasets analysed during the current study will be made available on reasonable request. Data will be made available for scientific purposes for researchers whose proposed use of the data has been approved by the research team.

Authors' contributions

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Methodology: Renad Alotaibi and Maram Alabdullah.

Investigation: Renad Alotaibi and Malak Albakheet

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Reviewing, Editing and Approving final version: All authors

Supervision: Maram Alabdullah, Fay Alobaidarabali, Malak Albakheet, and Aymen Alqurain

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