

# Prevalence of Hookah smoking and associated factors among male high school students in Iraq.

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## Research article

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# Abstract

**Background** The use of the hookah-smoking device is increasing at a large scale in the Eastern Mediterranean region and reaching to Western countries. Hookah smoke users are exposed to a lot of chemical compounds and several chronic diseases. The purpose of this study was to determine the prevalence of hookah use among male high school students and to study different associated factors linked with hookah smoking.

**Methods** A descriptive cross-sectional study was conducted among students in three high schools in Al-Karkh District, Baghdad. The study period was from Oct. 2017 till Jan. 2019 and included 847 male students. A structured Knowledge Attitude and Practice questionnaire was used to identify their knowledge and use of hookah smoking. Descriptive, chi-square, bivariate and multivariate logistic regression analysis of data was carried out using the available software statistical package of SPSS-25.

**Results** The overall prevalence of hookah smoking among high school male students was high (46%). More than two-thirds (70.6%) of them think that waterpipe smoking is acceptable socially more than cigarette smoking. More than half of the participants (55%) first heard about hookah smoking from friends and friends constitute close to two-thirds (65.2%) of those who smoke hookah around students. Almost half of the respondents think hookah smoking is not encouraged in the faith of Islam (47.3%) and less than a quarter (20.9%) think it's completely forbidden in Islam.

**Conclusions** Hookah smoking is increasing among high school students and becoming a socially acceptable behavior that needs preventive strategies targeting this age group.

# Background

Globally, tobacco use is considered the second leading cause of death, and it is responsible for the deaths of 1 in 10 adults [1]. Many carcinogenic compounds are found in the smoke from tobacco which is the leading cause of different types of cancer in the body especially; lung cancer [2] is considered the leading cause of cancer mortality in the world [3]. In addition to cancer, it can cause several respiratory infections where nicotine contained in cigarette smoke decreases the immune response defending the body from malignant growth [4]. Smoking along with hypertension and diabetes, among others are major risk factors for cardiovascular diseases. The effects of each of these risk factors potentiate the risk of cardiovascular events [5,6,7].

Hookah "Shisha, Hubble-Bubble, Nargileh & Water-Pipe (WP)" smoking is another form of tobacco use. Although hookah smoking practices dating back at least 400 years, nowadays the use of this device to smoke is increasing at large scale from the Eastern Mediterranean region reaching Western countries [8,9]. Hookah design features a water bowl size, hose, and mouthpiece. Several studies have been shown that hookah contains harmful chemicals [10–13], and a single 45-minute hookah session can expose the smoker to 48.6 times the amount of smoke as to smoking a cigarette [14]. In the US and from 2011 to 2016, current use of hookahs increased among middle and high school students, and in the year 2016 2% of middle school students reported that they had used a hookah in the past 30 days "an increase from 1.0% in 2011" [15,16]. Also in the US, a study shows the prevalence of Males use hookah more than females (17).

In Iraq, few research studies are related to hookah smoking and were done mostly among college students [18]. This study aimed to find out the prevalence of hookah use among male high school students and the associated factors with it.

## Methods

A cross-sectional survey of adolescent students in high schools in Baghdad was done. The cluster was a convenient non-probability sampling within one of the two districts in Baghdad (Al-Karkh and Risafa). Al-Karkh side "twin half of Risafa side" of Baghdad City was selected to be the place of study which consists of 3 educational directorates. One school was selected at simple random sampling from each directorate to be the sample representative of the students. All students were recruited as the population under study.

Ethical approval was granted by the ethical committee at Anbar University and Directorate of education at Al-Karkh district. Also, permission from school principals and staff was obtained to enter classes and made interviews with the students. Students were verbally consented by the research staff and according to accepted research standards in Iraq, no parental consent was required. The collection of data was from Oct. 2017 till Jan. 2019.

Sample size calculation is based on the equation:  $(n = Z^2 \cdot 1-a \cdot p \cdot (1-p) / d^2)$  where n is the required sample size [19] and sample size of 847 students aged 15 to 18 years old were included in the study, with level of significance at 5%, and a random selection of high schools was made to include all eligible students. The questionnaire was based on the California Tobacco Surveys for tobacco use [20] and modified to the social context of Iraq. A structured Knowledge, Attitude and Practice (KAP) questionnaire form was prepared to students which include questions to identify their knowledge and use of hookah smoking, their sources to obtain tobacco hookah smoking, the effect of cultural and social relations in starting hookah smoking, and their ability to quit hookah smoking.

Analysis of data was carried out using the available software statistical package of SPSS-25 (Statistical Packages for Social Sciences- version 25). Data were presented in simple measures of frequency, percentage, mean, standard deviation, and range (minimum-maximum values). The significance of the difference between different percentages (qualitative data) was tested using the Pearson Chi-square test ( $\chi^2$ -test) with the application of Yate's correction or Fisher Exact test whenever applicable. Bivariate application and multivariate logistic regression analysis of data was carried out for comparison between independent variables among those who smoke hookah. Statistical significance was considered whenever the P-value was equal or less than 0.05.

## Results

Table 1 shows that a highest percentage of students first heard and knew about hookah from friends (55%) and most of them (86.1%) knew that there is a café shop for hookah smoking near their residence. It was found that the friends who smoke hookah are the highest group among the people who surround the hookah user (65.2%) followed by close relatives (31.6%), brothers/sisters (31.6%) and father/mother (4.5%).

Participant's opinion about different types of smoking and its effect on health from the worst to the better rate order was hookah, cigarette, e-cigarette and tobacco gum.

The student's knowledge about Islam's opinion regarding shisha smoking as mostly being discouraged (47.3%) or forbidden (20.9%).

More than two-thirds (70.6%) of the students think that waterpipe smoking is more acceptable socially than cigarette smoking and only 37.1% of them thought that waterpipe smoking was less harmful and less addictive

than cigarette smoking. There was an agreement for the need for regulations to prevent or forbid hookah café places (81.5%).

**Table 1:** First heard about hookah, Café near a residence, smoke hookah from the surrounding, Opinion of participants regarding the harmfulness of tobacco, Islam's opinion, social acceptance, hookah harmfulness and addictiveness, and regulations against hookah café.

		No	%
First, heard/know about Hookah?			
Father & Mother		36	4.3
Brothers, Sister & Cousin		143	16.9
Friends		466	55.0
Media and Newspaper		73	8.6
Saw a Hookah Café shop		120	14.2
Others (internet)		40	4.7
The present of Cafe for hookah smoking around students' residence		729	86.1
Who smoke hookah from those surrounding the student			
Father & Mother		38	4.5
Brothers & Sisters		69	8.1
Other close relatives		268	31.6
Friends		552	65.2
None		76	9.0
Which is of the following types of smoking are more harmful to health?	Tobacco gum	50	5.9
	Cigarette	293	34.6
	e-cigarette	202	23.8
	Hookah	302	35.7
Hookah smoking in Islam.	Forbidden	177	20.9
	Discouraged	401	47.3
	Allowed	79	9.3
	Do not know	190	22.4
Is hookah smoking is acceptable socially more than Cigarette smoking?	Yes	598	70.6
	No	249	29.4
Is hookah smoking is less harmful and less addictive than cigarette smoking?	Yes	314	37.1
	No	533	62.9
Do agree on regulations to forbid café places	Yes	690	81.5
	No	157	18.5

Regarding the average number of hookah smoked in the last 30 days, table 2 shows that 28.1% tried it once, 16.6% tried it twice, and 11.3% tried it three times. Among hookah smokers, 85.5% smoked it in the last six months. Age at first hookah use was the highest at the age of 16 and 15 (27.4 % and 26.3 % respectively), followed by the age of 14 (15.1%). The average number of hookah smoking sessions among current regular users per day was one in 13.3%, two, three, four, five times and more in 34.3, 31, 20.7 & 0.8% respectively. The prevalence of sharing the mouthpiece with others during hookah smoking was never in 30.7%, sometimes in 34.6%, most of the time in 15.1%, and always in 19.7% of the students.

**Table 2:** Number of hookahs smoked (last month), hookah smoking in the last 6 months, age first smoked hookah, hookah sessions per day, duration of sessions, mouthpiece sharing, confident to quit hookah smoking.

		No	%
The average number of hookah smoked in the past 30 days (even one puff).	1	110	28.1
	2	65	16.6
	3	44	11.3
	4	16	4.1
	5	23	5.9
	6	6	1.5
	7---13	48	12.4
	14---20	32	8.3
	21---27	3	0.9
	28---49	32	8.2
	≥50	12	3.4
	Smoking hookah in the last 6 months	Yes	335
No		56	14.3
Age you first smoked hookah	<10 years	6	1.5
	10	14	3.6
	11	7	1.8
	12	19	4.9
	13	30	7.7
	14	59	15.1
	15	103	26.3
	16	107	27.4
	≥17 years	46	11.8
	The average number of hookah smoking sessions/day among regular users	One	52
Two		134	34.3
Three		121	31.0
Four		81	20.7
Five & more		3	0.8
Sharing the mouth-piece with others during hookah smoking	Never	120	30.7
	Sometimes	135	34.6
	Most of the times	59	15.1
	Always	77	19.7
How confident that you can quit hookah smoking	Completely confident	239	61.2
	Confident	83	21.3
	Some Confident	30	7.7
	Not that Confident	22	5.6
	Not Confident at all	17	4.3
Duration of hookah smoking at each session (minutes)	<15 minutes	58	15.0
	15---	20	5.1
	30---	95	24.3
	45---	24	6.2
	60---	139	35.6
	≥120 minutes	55	14.2

Regarding the place of hookah smoking, high rate of students smoke at Café shop (61.1%) and more than three-quarters of participants in this study get their hookah tobacco from a hookah shop (78%).

Low prevalence rate (only 12.9%) think that Electronic cigarette (e-cigarette) can be a substitute to hookah smoking but high percentage of them (61.3%) do not know if it is less harmful and less addictive than hookah smoking.

Table 3 demonstrates the association between hookah smoking among students and various factors. The association was significant with friends (first heard about hookah), media, café around residence, brother & sister (who smoke around student) and friends, Cigarette more harmful than other types of smoking, Islam discourage smoking, socially acceptable and within regulation to forbid café shop.

**Table 3:** Bivariate analysis for association of different factors affecting hookah smoking.

		Hookah smoking among high school students (even one puff)				P-value
		Yes		No		
		No	%	No	%	
From where the student first heard/know about Hookah?						
Father & Mother	Yes	18	4.6	18	3.9	0.637
	No	373	95.4	438	96.1	
Brother, Sister & Cousin	Yes	72	18.4	71	15.6	0.271
	No	319	81.6	385	84.4	
Friends	Yes	233	59.6	233	51.1	0.013
	No	158	40.4	223	48.9	
Media and Newspaper	Yes	23	5.9	50	11.0	0.009
	No	368	94.1	406	89.0	
Saw a Hookah Café shop	Yes	52	13.3	68	14.9	0.502
	No	339	86.7	388	85.1	
Others (internet)	Yes	14	3.6	26	5.7	0.147
	No	377	96.4	430	94.3	
There is a Cafe for hookah smoking around students' residence	Yes	354	90.5	375	82.2	0.0001
	No	25	6.4	33	7.2	
	Do not know	12	3.1	48	10.5	
Do you smoke hookah from those surrounding the student						
Father & Mother	Yes	23	5.9	15	3.3	0.069
	No	368	94.1	441	96.7	
Brother & Sister	Yes	40	10.2	29	6.4	0.040
	No	351	89.8	427	93.6	
Other close relatives	Yes	131	33.5	137	30.0	0.280
	No	260	66.5	319	70.0	
Friends	Yes	282	72.1	270	59.2	0.0001
	No	109	27.9	186	40.8	
None	Yes	13	3.3	63	13.8	0.0001
	No	378	96.7	393	86.2	
Student opinion: Which is of the following types of smoking : more harmful to health?	Tobacco	26	6.6	24	5.3	0.0001
	gum					
	Cigarette	170	43.5	123	27.0	
	e-cigarette	95	24.3	107	23.5	
Student opinion: hookah smoking in Islam.	Hookah	100	25.6	202	44.3	0.0001
	Forbidden	53	13.6	124	27.2	
	Discouraged	190	48.6	211	46.3	
	Allowed	54	13.8	25	5.5	
Do you think that hookah smoking is acceptable socially more than cigarette smoking?	Do not know	94	24.0	96	21.1	0.0001
	Yes	316	80.8	282	61.8	
	No	75	19.2	174	38.2	
Do you think that hookah smoking is less harmful and less addictive than cigarette smoking?	Yes	215	55.0	99	21.7	0.0001
	No	176	45.0	357	78.3	
Do you agree on regulations to forbid café places	Yes	283	72.4	407	89.3	0.0001
	No	108	27.6	49	10.7	

In Table 4, logistic regression reveals that all sub variables among who smoke from surrounding students, hookah acceptable socially, hookah less harmful than cigarette, Islam forbid smoking, and regulation to forbid café shop are significantly associated with hookah smoking among high school students.

Table 4: multivariate logistic regression of risk factors affecting hookah smoking

	B	df	P value	Odds Ratio	95% C.I. for odds ratio	
					Lower	Upper
<b>heard/know about Hookah? (café near residence (Ref)</b>						
ends	0.051	1	0.948	1.052	0.226	4.891
father & Mother	0.070	1	0.921	1.073	0.268	4.288
father, Sister and cousin	-0.154	1	0.822	0.857	0.225	3.273
radio & Newspaper	0.456	1	0.537	1.578	0.371	6.709
work at a café shop	0.240	1	0.734	1.271	0.318	5.080
<b>do not smoke hookah from those surrounding (None (Ref)</b>						
father & Mother	-1.863	1	0.001	0.155	0.052	0.459
father & Sister	-1.997	1	0.0001	0.136	0.054	0.340
other close relatives	-1.577	1	0.0001	0.207	0.095	0.451
ends	-1.687	1	0.0001	0.185	0.087	0.394
<b>Which of the following types of smoking are more harmful to health (e-cigarette)</b>						
e-cigarette	-0.226	1	0.526	0.798	0.396	1.605
hookah	-0.506	1	0.011	0.603	0.408	0.892
tobacco gum	-0.378	1	0.074	0.685	0.452	1.037
<b>Do you think smoking is acceptable socially more than Cigarette smoking? No (Ref)</b>	-0.680	1	0.0001	0.507	0.355	0.724
<b>Do you think smoking is less harmful and less addictive than cigarette smoking? (No (Ref)</b>	-1.195	1	0.0001	0.303	0.215	0.426
<b>Do you think smoking is haram in Islam. (Do not know (Ref)</b>						
forbidden	0.600	1	0.015	1.823	1.126	2.950
discouraged	-0.024	1	0.905	0.976	0.656	1.451
allowed	-0.458	1	0.146	0.633	0.341	1.173
<b>Do you support government regulations to forbid café places. (No (Ref)</b>	0.947	1	0.0001	2.578	1.694	3.923

## Discussion

In this first study of male high school students in Baghdad, we found that although most students who smoked hookah had correct opinions about the harm of hookah smoking as well as support for regulations against café shops, the overall prevalence of hookah smoking among those students was high (46%). This high prevalence is similar to a study in Saudi Arabia (secondary school adolescence male, aged >18 years) where the overall prevalence of hookah smoking was 44% [21]. However, this was much higher than the prevalence in Iran and Jordan. Abbas *et al.* and Alzyoud *et al.* studies of Iranian and Jordanian high school male students reported different lower rates (6% and 24% respectively) [22,23]. The high reported in our study might reflect the acceptance and spread of such harmful behavior in such a young age group of students due to recent problems of conflict imposed on Iraq making smoking control and education a priority.

More than half of participants first heard about hookah smoking from friends and more than two-thirds have friends who smoke hookah which highlighted the role of friends in initiating hookah smoking and play as an important factor of their tendency towards using it more and more. The same findings were reported by Azodi *et al.* and Bejjani *et al.* [24, 25]. This points out a new generation of hookah users, unlike previous generations where it was not smoked as commonly which is seen globally.

Among different types of tobacco smoking, hookah smoking was the highest among students who believe it causes more harm to the health of humans. Aslam *et al.* in his review explained the significant association between hookah smoking and increased risk of heart disease, cancer, and hypercholesterolemia. [26]. Although adolescents in this study believe that hookah has worse health effects on them than other types of smoking but

perhaps the effect of the nice aroma of smoke, flavor, and taste of hookah smoking overcomes their perception about harm and choice of smoking. Besides, the hookah device can bring new and more groups of friends smoking together in restricted or specific places. These could explain the reason hookah smoking is more acceptable socially than cigarette smoking. This is in agreement with Fitzpatrick *et al.* in the USA, Momenabadi *et al.* in Iran and Tamim *et al.* in Lebanon all showed that attempts of hookah smoking among young adult users were associated with their belief that it is socially and culturally acceptable than cigarette smoking [27-29]. All this led to an increase in the prevalence of this behavior. Therefore, it is a challenge that norm of acceptance can be changed in the society so that hookah users consider it similar to cigarette smoking.

High prevalence of students thinks hookah smoking is discouraged and forbidden in Islam (68.2%) reflecting that religion could play an important role in preventing smoking in addition to a lot of risky behaviors such as drug abuse, gambling, alcohol drinking. A study was done in Jordan where they studied smoking habits among university students in different faculties and academic level, it showed that those in the faculty of religious studies were less likely to smoke compared to those in other faculties [30].

More than one-third of hookah smokers in this study share the same mouthpiece of hookah devices most of the time and always. Sharing the same mouthpiece with a different group of people and friends can lead to different types of infection from mouth, sputum, and lung. Munckhof *et al.* concluded in his study that transmission of tuberculosis was found in people sharing a marijuana hookah with a case of pulmonary TB [31].

Sajid *et al.* reported that carboxyhemoglobin concentration in cigarette smokers is lower (6.1 ppm) as compared to shisha smokers (8.8 ppm) [32]. In the current study more than three-quarters of adolescence smoke hookah for equal or more than 30 minutes at each session. Duration of hookah smoking sessions, depth of inhalation, and frequency of puffing all participate in the level of exposure to nicotine and other carcinogenic chemical materials present in charcoal and tobacco in shisha smoke. In this report, more than three-quarters were confident that they can quit hookah smoking. It's doubtful they could quit hookah smoking. As mentioned above hookah has more concentration of carboxyl group, nicotine, and other chemical materials than cigarette smoking that has addictive patterns once the body is saturated with its difficult to withdraw or quit from smoking.

Multivariate logistic regression in this study shows a significant difference among subgroups of those who smoke around the students that can reflect the influence of family and peers on adolescent health and behavior [33]. The hookah was the only sub variable significant among others in comparison with the reference category e-cigarette. Also, hookah smoking is acceptable socially and less harmful than cigarette smoking, and agree on regulations to forbid café places all were significant in comparison with their references.

### **Limitations and strength of the study**

The study was not a random representation of all Iraqi high school students but we believe that these results would be relevant to the rest of the students in the country given the similar social norms across the country. Also, the questions might be sensitive to some leading to underreporting. However, the students filled the questionnaire in absence of their teachers, and therefore no one would be able to track the answers to specific students. There were no missing forms.

## **Conclusions**



Hookah tobacco smoking rates are very high among high school students and becoming an acceptable socio-cultural phenomenon in Iraq, urging the need for effective preventive measures to be started to overcome the spread of hookah smoking among adolescents who will carry this addiction into adulthood.

## **Declarations**

### **Ethics approval and consent to participate**

The Research Ethics Committee at the College of Medicine, University of Anbar approved the study. All students were informed of the study purpose and the voluntary and anonymous nature of participation, before providing written informed consent.

### **Consent for publication**

'Not Applicable'

### **Availability of data and material**

The datasets generated and/or analyzed during the current study are not publicly available.

### **Competing interests**

The authors declare that they have neither competing interests nor financial disclosure.

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### **Authors' contributions**

Both authors read and approved the final manuscript.

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## Abbreviations

KAP: Knowledge, Attitude, Practice

WP: Water Pipe

e-cigarette: electronic cigarettes

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