

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

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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 and provide tobacco control officials an understanding of this public health problem.

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 aged 15–18 years old. A convenient non-probability sampling within one of the two districts in Baghdad was selected to be place of study. Descriptive, chi-square test of significance, bivariate and multivariate logistic regression analysis of data was carried out for identifying risk factors associated with hookah smoking among high school adolescence.

Results The overall prevalence of hookah smoking among high school male students was high (46.1%). More than two-thirds (70.6%) of them think that hookah smoking is acceptable socially more than cigarette smoking. Hearing first about it from friends, the media and presence of a café for hookah near residence were found to be significantly associated ($p > 0.05$) with hookah smoking among students. Similarly, having friends surrounding students who used hookah were found to be significantly associated with hookah smoking among students. Among hookah smokers, they were less likely to say it is forbidden in Islam and more likely to say it is allowed in Islam than non-hookah users.

Conclusions Hookah smoking is high among high school students and becoming a socially acceptable behavior. Social and religious factors play a role in that. Family members, relatives and peers have an important role in prevention of hookah smoking among these students. Teenage students need to be educated about hookah effects on their health.

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 date 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 [10]. Several studies have been shown that hookah contains harmful chemicals [11–14], and a single 45-minute hookah session can expose the smoker to 48.6 times the amount of smoke as to smoking a cigarette [10, 15]. In the US and during 2011–2015, significant increase found for current use of hookah (4.1–7.2%) among high school students [16, 17]. Another study in the US, shows that the percentage of both ever and current use of hookah smoking were higher among Males than females [18].

There is a misconception that young people think hookah smoking is less harmful than smoking cigarettes due to the possible filtration effects provided by the water [19]. Actually, toxicants in a single hookah tobacco smoke puff contains substances multiple times in compared to single cigarette smoke, for example polycyclic aromatic hydrocarbons, nicotine, carbon monoxide, nitric oxides and formaldehyde [10,20–22].

Tumbak, Mouassal and Jurak are the main different types of hookah tobacco, each contains different materials. Tumbak, is unflavored tobacco leaves (Ajami). Jurak contains tobacco, 20% dried fruit, and sugarcane. Both previous types are used widely in Asia and Middle East. While Mouassal contains 70% sugarcane, glycerol, flavors, and 30% tobacco [23–25]. The pleasant smell and mild taste from these different hookah tobacco flavors encourage people, including adolescence, to use hookah. Different flavors are used; fruit flavored tobacco, chocolate, spice, alcohol, menthol, candy, sweet, molasses and many others [26–28].

In the Middle East, the role of religion and legal legislation, role of friends and family, individuals with low-self-confidence, access to hookah smoke, social acceptance and culture, are all significant factors contributing to hookah smoking [29–32].

In Iraq, few research studies are related to hookah smoking and were done mostly among college students [33]. Males rather than females smoke hookah. This study aimed to find out of the factors associated with hookah use among male high school in order to understand how health policy makers and the government can approach this growing public health problem.

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-Kharkh 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. 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. 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: $(n = Z^2 \cdot P(1-P)/d^2)$ where n is the required sample size, $Z^2 \cdot P(1-P) =$ confidence interval (95% = 1.96, $P =$ estimated proportion, $d =$ desired precision [34] and sample size of 847 students were included in the study, with level of significance at 5%, and a random selection of high schools from a list of school we gave each school a number and then chose a number for three schools to include all eligible students aged 15 to 18 years old. The questionnaire was based on the California Tobacco Surveys for tobacco use [35] 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). Almost all data are normally distributed except for the variable 'regulation to close hookah café shops' has positive skewness (longer tail on the right). 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 (descriptive data) was tested using the Pearson Chi-square test (χ^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. The criteria for using variables in the multivariate logistic regression was based on the significant variables in bivariate analysis. Statistical significance was considered whenever the P-value was equal or less than 0.05.

Results

The prevalence of hookah smoking among students

The study's participants consisted of 847 high school students; the prevalence of those who smokes hookah tobacco was (46.1%).

Table 1 shows that more than quarter of them (28.1%) tried hookah once for the last month, (16.6%) of students smoked hookah tobacco twice, while only (3.4%) of them smoked hookah for ≥ 50 times for the last month.

First smoked hookah and sessions per day

Highest rate of students who started smoking hookah was between the age of 15 and 16 (26.3% & 27.4% respectively), while the lowest rate was below the age of 10 (1.5%). The highest rate of hookah smoking sessions per day among current regular users were two and three session, 34.3% and 31% respectively. While the highest duration at each session (minutes) were 30-44 minutes and 60-119 minutes, 24.3% and 35.6% respectively.

Table 1: Descriptive characteristics associated with hookah smoking(last 6 months), duration of hookah sessions, and other variables.

Variable & Category		n	%
Hookah smoked in the past 30 days.	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
Hookah smoked in the last 6 months	Yes	335	85.7
	No	56	14.3
Age 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
Hookah smoking sessions/day among regular users	One	52	13.3
	Two	134	34.3
	Three	121	31.0
	Four	81	20.7
	Five & more	3	0.8
Sharing mouth-piece of hookah-smoking device	Never	120	30.7

	Sometimes	135	34.6
	Most of the times	59	15.1
	Always	77	19.7
Student's confidence that he 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

First heard about hookah and people surrounding hookah users

Table 2 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. Friends who smoke hookah are the highest group who surround the hookah users (65.2%) followed by close relatives (31.6%), brothers/sisters (31.6%) and father/mother (4.5%).

Islam's Opinion regarding hookah smoking, socially acceptance and agreement on regulation

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

More than two-thirds (70.6%) of the students believe that hookah smoking is more acceptable socially than cigarette smoking. There was an agreement of more than three quarters of students of the need for regulations to prevent or forbid hookah café places (81.5%).

Table 2: Social factors associated with hookah users, including Islam's opinion about hookah use, social acceptance, and other variables.

Variable		n	%
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
Presence of Cafe for hookah smoking around students' residence		729	86.1
People surrounding/near students that smoke hookah.			
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 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
Student's opinion for 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 acceptable socially more than Cigarette smoking?	Yes	598	70.6
	No	249	29.4
Is hookah smoking is less harmful and addictive than cigarette smoking?	Yes	314	37.1
	No		

		533	62.9
Agree on regulations to forbid café places?	Yes	690	81.5
	No	157	18.5

Bivariate analysis on the associations between related factors and the risk of high school students' hookah smoking

The bivariate analysis demonstrated that friends, media, and presence of café shop near student's residence sub group's variables were more likely to use hookah smoking compared to other subgroups in the same variable (first heard). As for people surrounding students, it was reported that brother and sister, friends, and none are more likely effect students to use hookah smoking. Among four types of smoking, students believe that cigarette has more hazards effect on human health than using hookah tobacco smoking (43.5% Vs 25.6%). Hookah is accepted socially and agreement on regulation on café shops, both were highly significant risk factors for hookah smoking among high school adolescence.

(Table 3).

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		
		n	%	n	%	
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	
Presence of 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	
People surrounding/near students that smoke hookah.						
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	
Which of the following types of smoking are more harmful to health?	Tobacco gum	26	6.6	24	5.3	0.0001
	Cigarette	170	43.5	123	27.0	
	e-cigarette	95	24.3	107	23.5	
	Hookah	100	25.6	202	44.3	
Student's opinion for Hookah smoking in Islam.	Forbidden	53	13.6	124	27.2	0.0001
	Discouraged	190	48.6	211	46.3	
	Allowed	54	13.8	25	5.5	
	Do not know	94	24.0	96	21.1	
Is hookah smoking acceptable socially more than Cigarette smoking?	Yes	316	80.8	282	61.8	0.0001
	No	75	19.2	174	38.2	
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	
Agree on regulations to forbid café places	Yes	283	72.4	407	89.3	0.0001
	No	108	27.6	49	10.7	

Multivariate analysis on the associations between related factors and the risk of high school students' hookah smoking

Multivariate logistic regression analysis was used to investigate the significant risk factors for hookah smoking. The significance level for all the analyses was set at $P < 0.05$.

Table 4 presents the results that revealed different risk factors associated with hookah smoking. A significant association was found among seven people surrounding students under study (father & mother, brother & sister, close relative, friends), moreover hookah was considered by all students to be more harmful than other types of smoking.

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
First heard/know about Hookah? (café near residence (Ref))						
Friends	0.051	1	0.948	1.052	0.226	4.891
Father& Mother	0.070	1	0.921	1.073	0.268	4.288
Brother, Sister and cousin	-0.154	1	0.822	0.857	0.225	3.273
Media & Newspaper	0.456	1	0.537	1.578	0.371	6.709
Saw a Hookah Café shop	0.240	1	0.734	1.271	0.318	5.080
People surrounding/near students that smoke hookah. (None (Ref))						
Father & Mother	-1.863	1	0.001	0.155	0.052	0.459
Brother & Sister	-1.997	1	0.0001	0.136	0.054	0.340
Close relatives	-1.577	1	0.0001	0.207	0.095	0.451
Friends	-1.687	1	0.0001	0.185	0.087	0.394
Which of the following types of smoking are more harmful to health? (e-cigarette (Ref))						
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
Is hookah smoking acceptable socially more than Cigarette smoking?? No (Ref)	-0.680	1	0.0001	0.507	0.355	0.724
Hookah smoking is less harmful and less addictive than cigarette smoking? (No (Ref))	-1.195	1	0.0001	0.303	0.215	0.426
Student's opinion for Hookah smoking in Islam.. (Do not know (Ref))						
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
Agree on regulations to forbid café places. (No (Ref))	0.947	1	0.0001	2.578	1.694	3.923

Discussion

This is a study of the risk factors associated with hookah smoking among male high school students in Iraq. 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, still the overall prevalence of hookah smoking among those students was high (46%). This high rate of smoking hookah is similar to a study in Saudi Arabia (secondary school adolescence male, aged > 18 years) that showed the prevalence of hookah smoking was 44% [36]. However, studies reported by Abbas *et al* and Alzyoud *et al* in Iranian and Jordanian high school male students showed different and much lower rates of 6% and 24% respectively [37,38]. The high rate 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 tobacco control a priority that the government needs to address. This is the first study to explore the multiple social factors associated with smoking hookah in this age group. It is also the first study that integrates the role of religion in smoking. This can provide health policy makers the tools needed to develop policies or interventions to tackle this growing and serious public health problem. This might also be applied to the region as a whole, as they share similar culture and language and the use of hookah is increasing everywhere.

More than half of participants first heard about hookah smoking from friends and more than two-third have friends who smoke hookah, which highlights the role of friends in initiating hookah smoking. The same findings were reported by Azodi *et al* and Bejjani *et al* [39, 40]. This points to the fact that a new generation of hookah users is present, unlike previous generations where it was not smoked as commonly as now.

Among different types of tobacco smoking, high school students from this study think that hookah smoking causes more harm to the health of humans than other tobacco types. Aslam *et al*. in his review explained the significant association between hookah smoking and increased risk of heart disease, cancer, and hypercholesterolemia [41]. Although adolescents in this study believe that hookah has worse health effects on them than other types of smoking, they still smoke it. This is perhaps the effect of the nice aroma of smoke, flavor, and taste of hookah smoking that can overcome their perception about its harm. It can also be due to peer pressure as the hookah device can bring new and more groups of friends smoking together in social places. This 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 who showed that attempts of hookah smoking among young adult users were associated with their belief that it is socially and culturally more acceptable than cigarette smoking [42–44]. All this led to an increase in the prevalence of this behavior. Therefore, it is a challenge that the social norm of acceptance now cannot be easily changed in the society.

High percentage of students think hookah smoking is discouraged and forbidden in Islam (68.2%) reflecting that religion and faith could play an important role in preventing smoking in addition to a lot of

other risky behaviors such as drug abuse, gambling, alcohol drinking [45]. A study was done in Jordan where they studied smoking habits among university students in different faculties and academic levels and showed that those in the faculty of religious studies were less likely to smoke compared to those in other faculties [46].

Sajid *et al.* reported that carboxyhemoglobin concentration in cigarette smokers is lower (6.1 ppm) as compared to shisha smokers (8.8 ppm) [47]. In the current study more than three-quarters of adolescent hookah smokers smoked for 30 minutes or more 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 study 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 high concentrations of carboxyl group, nicotine, and other chemicals, even higher than cigarette smoking, and has addictive impact on the body causing withdrawal symptoms when trying to quit.

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 [48]. The hookah was the only sub variable significant among others in comparison with the reference category e-cigarette. Also, hookah use was higher among those who say hookah smoking is acceptable socially and less harmful than cigarette smoking.

Limitations And Strength Of The Study

Only one school from each directorate was selected in this study due to absence of financial support and for security reasons. Therefore 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 district given the similar social norms across the country.

In all three schools, the school administration refused to enroll the sixth grade (final graduation level) high school students in this study due to their valuable time in studying difficult subjects aiming to graduate from high school level to Universities and Colleges level. If we had included sixth grade students in our study these factors associated with hookah might have become more significant.

Because the study was limited to young male students, socio demographic characteristics was not included in the questionnaire. Hookah is rarely smoked by females in high schools.

Also, the questions might lead to underreporting since hookah and cigarette smoking in high school is not accepted socially. However, the students filled the questionnaire in the absence of their teachers, and therefore no one would be able to track the answers to specific students. There were no missing forms.

Conclusions

This cross sectional study reported high hookah tobacco smoking rates among students of the three high schools and becoming an acceptable socio-cultural phenomenon in Iraq. The significant determinants that make students use hookah smoking include of risk factors: source first heard about hookah, people near students that use hookah, socially acceptable practice, Islam's opinion regarding hookah smoking, and regulation to forbid hookah café places. Effective control measures are required including health education, school intervention programs, tight legislation, increase taxes on tobacco to prevent further adolescent students involved in this unhealthy practice of hookah smoking.

Further studies are needed to highlight the kind of interventions needed to deter young students from trying hookah, such as education, having role models from society discourage it, or a media campaign and penalty for those who sell hookah tobacco and products to youth. These findings have implications to the region. For example, the faith if Islam is practiced by the majority of people in the region and if the belief that hookah is forbidden in Islam leads to lower use of hookah this can be taken up by religious authorities in the region. Further studies are needed to compare similar aged youth across the region and understand the differences and similarities of this behavior and public health problem.

Abbreviations

KAP

Knowledge, Attitude, Practice

WP

Water Pipe

e-cigarette

electronic cigarettes

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

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