Original Article

Prevalence and Perception of Shisha Smoking among University Students: A Cross-sectional Study

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Abstract

Aims and Objectives: Understanding perceptions and factors behind the rise in the prevalence of shisha smoking is important for the development of prevention strategies and policies. The aim of this descriptive study was to assess the prevalence and perception of shisha smoking among university students.

Materials and Methods: The anonymous, self-structured 12-item questionnaire was administered to 450 male university students, with an overall response rate of 82.44% (n = 371). Prevalence, knowledge, and other associated factors regarding shisha smoking were compared between dental and other specialty students using SPSS software for descriptive statistical analysis.

Results: Among 371 university students, 40.43% (n = 150) were nonsmokers, 32.88% (n = 122) were shisha smokers, 12.94% (n = 48) were cigarette smokers, and 13.75% (n = 51) smoked both shisha and cigarette. The overall prevalence of shisha smoking (46.63%, n = 173) was higher than that of cigarette smoking (26.68%, n = 99). The percentage of those knowledgeable about the ill effects of shisha smoking was 44.2% with lesser knowledge among shisha smokers than cigarette smokers. There was no statistically significant difference in the mean total knowledge score between dental (5.65 ± 2.08) and other specialty (5.21 ± 2.3) students.

Conclusions: A high prevalence of shisha use among university students is reported in this study as well as a general lack of understanding of the dangers involved with this behavior. Study authors recommend the development of policies targeted at preventing further rise in the prevalence of shisha smoking through the implementation of preventive strategies such as incorporating this topic into the school syllabus and encouraging research on shisha smoking.

Keywords: *Prevalence, public health, smoking, tobacco, water-pipe smoking*

Received : 19-11-18.
Accepted : 06-03-19.
Published : 07-06-19.

Introduction

Shisha smoking is a century old tobacco use method with an ambiguous origin.[1] It is a growing health concern and known by several names that includes "hookah," "water-pipe smoking," "nargile," "goza," and "hubble hubble." Shisha smoking is on the rise among youth worldwide.[2] It is a common practice in Arabic countries as well as some Asian countries. Although common throughout all age groups, it is particularly popular with teenagers. It often occurs among friends in social settings such as private residences or in venues that offer ready to smoke shisha to customers.[3]

It has been reported that most shisha smokers are unaware of the deleterious health consequences of shisha smoking.[4-6] Maziak *et al*. in a systematic review, report shisha smokers believed the toxins in the smoke are filtered out by the water in the pipe.[7] Hence, it is less harmful and nonaddictive.[7] This however is not the case

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Access this article online

Quick Response Code:

Website: www.jispcd.org

DOI: 10.4103/jispcd.JISPCD_407_18

How to cite this article: Muzammil, Al Asmari DS, Al Rethaiaa AS, Al Mutairi AS, Al Rashidi TH, Al Rasheedi HA, *et al*. Prevalence and perception of shisha smoking among university students: A cross-sectional study. J Int Soc Prevent Communit Dent 2019;9:275-81.

as it contains same substances as cigarette smoke such as carbon monoxide (CO), tar, and nicotine.[8] Shisha smoke contains a wide array of chemical substances, many of which are highly toxic and carcinogenic for humans.[9] These include significantly higher quantity of heavy metals such as arsenic, nickel, cobalt, chromium, lead, and cadmium than that of cigarette smoke.[10] Longer duration of shisha sessions results in greater nicotine exposure than cigarette smoking[11] and also CO level in shisha smoke is higher than that of cigarette smoke.[12] The inhaled amount of CO can be as much as ten times high.[13]

Shisha smoking is a threat to both the oral and general health of the public. It has been associated with adverse oral health outcomes.[14-16] Shisha smoking acutely leads to increased heart rate, blood pressure, impaired pulmonary function, and CO intoxication.[17] Chronic bronchitis, emphysema, and coronary artery disease are serious complications of long-term use and lung, gastric, and esophageal cancer are associated with shisha smoking as well as periodontal disease, obstetrical complications, osteoporosis, hematological, and mental health problems.[9,17-19] Shaikh *et al*. have demonstrated that shisha smoking for 30 min is associated with an increase in systolic blood pressure of 12–16 mmHg, an increase in diastolic blood pressure of 2–8 mmHg and a rise in heart rate and respiratory rate by 6–15 beats/min and 2 breaths/min, respectively.[20] Shisha smoking leads to decreased baroreflex sensitivity, higher high sensitivity C reactive protein and alteration in endothelial function, risks factors for cardiovascular diseases.[21,22] Levels of total cholesterol, triglycerides, very low-density lipoproteins, and low-density lipoproteins increase in shisha smokers similar to the tobacco smokers.[23] In a study by Daniel *et al*., the myocardial infarction is significantly and independently associated with shisha smoking which is lower than that for cigarette smoking.[24] There is a profound negative effect of shisha smoking on pulmonary function, respiratory rate, and exercise capacity.[25,26] The long term use of shisha smoking results in decreased forced expiratory volume and forced vital capacity (FEV1, FVC, and FEV1/FVC), obstructive lung disease, chronic bronchitis, lung cancer and transmission of respiratory pathogens such as Mycobacterium tuberculosis.[9,18,27] Shisha smoking can lead to CO intoxication with transient loss of consciousness.[13] A systematic review by Raad *et al*., has concluded that shisha smoking has negative effect on lung function and likely to be a cause of chronic obstructive pulmonary disease.[28] Cognitive functions such as attention, alertness, and memory are also impaired by shisha smoking.[29] Shisha smoking has adverse influence on dental and periodontal health. Periodontal disease is a polymicrobial and multifactorial influenced by environmental factors such as smoking.[30] In a study by Malik *et al*., shisha smoking was found to be associated with increased periodontal attachment loss, periodontal pockets as well as alveolar bone loss.[31] Another study by Javed *et al*., has demonstrated increased gingival bleeding, periodontal pockets, clinical attachment loss, and marginal bone loss in shisha smokers.[15] Shisha smokers are three times more likely to develop post-third molar extraction dry socket than nonsmokers.[32]

The majority of studies, however, have been focused on the ill effects of cigarette smoking, thus, there is a scarcity of evidence regarding the prevalence, awareness, ill effects, and associated factors of shisha smoking among the young population. Therefore, the aim of this study was to assess the prevalence and perceptions of shisha smoking among university students.

Study Population and Methodology

This descriptive study is cross-sectional in design and was conducted between September 2016 and March 2017 with university students between the ages of 18–26 years in Buraidah city. An anonymous, self-administered questionnaire with 12 items [Table 1] was hand delivered to 450 male students at the university schools, of which, 371 responded to the questionnaire. The sample size was calculated using Cochran's formula at a 95% confidence interval. The questionnaire was

Table 1: Questionnaire used to assess the perception of shisha smoking among university students

Questions	Yes	No	Don't know
Is shisha smoking harmful to health?			
Is shisha smoking less harmful to oral and general health than cigarette smoking?			
Do the toxic substances in smoke are filtered out by water in shisha pipe?			
Is cool and moist smoke from the pipe is less harmful?			
Do mouthpieces have cotton or charcoal in the pipe filters the smoke?			
Is shisha smoking less addictive than cigarette smoking?			
Do you know the contents of shisha?			
Does it contain harmful substances?			
Can shisha smoking cause oral cancer or any other oral diseases such as gum problems?			
Can shisha smoking spread the infection from one person to other?			
Can shisha smoking cause lung cancer or other respiratory problems?			
Does shisha smoking affect other nonsmokers in the surrounding such as children?			

standardized and validated before the administration. A pilot study involving 50 students was carried to identify the variability. Based on the different answers given for each question, their choices were revised and standardized. Cronbach's alpha test was used to measure the internal consistency reliability. The content validity was determined by the department expert for consistency, simplicity, and clarity of the questionnaire.

The closed-ended questions included information on sociodemographic characteristics (age, marital status, university level, and specialty) and smoking status (type of smoking, age of start, number of shisha smoking sessions, duration of each session, any family members who smoked, who influenced to start the shisha smoking, place of smoking, and awareness of the parents).

The questionnaire also requested information about the knowledge and perception of students regarding the deleterious effects of shisha smoking on oral and general health. These responses were presented as yes/no/do not know. Every correct response was scored with a numerical value one and sum of all positive responses were calculated for total knowledge score. The prevalence and awareness of shisha smoking were compared between dental and other specialty students.

The study protocol was in accordance with the declaration of Helsinki and was approved by the Institutional Ethical Committee with reference number J-6827. Written informed consent was obtained from all the patients who participated in the study.

The statistical package for social science software version 21 (SPSS Inc, Chicago, IL, USA) was used to perform the descriptive statistical analysis of the data. The mean ± standard deviation was used to average the results of continuous measurements, and the difference between means was determined by one way ANOVA followed by Tukey's *post hoc* test and unpaired *t*-test as appropriate. $P < 0.05$ was consideed statistically significant.

Results

The questionnaire was given to 450 male university students between the ages of 18–26 years. Of these, 371 (81 dental and 290 other specialty students) responded with an overall response rate of 82.44%. Of these 371 respondents, 40.43% (n = 150) were nonsmokers and 59.57% (n = 221) were tobacco smokers. Of 221 tobacco smokers, 32.88% (n = 122) of university students were shisha smokers, 12.94% (n = 48) were cigarette smokers, and 13.75% (n = 51) smoked both shisha and cigarettes.

Of the 221 tobacco smokers, 20.81% (n = 46) were dental students and 79.19% (n = 175) were other specialty students. The overall prevalence of shisha smoking among 371 university students was 46.63% (n = 173) which was higher than the prevalence of cigarette smoking (26.68% n = 99). When a comparison was done between the dental and other specialty students, the results showed no significant difference in the prevalence of shisha smoking between dental students (45.66%, n = 79) and other specialty students (54.34%, n = 94). The prevalence of shisha smoking and its distribution among dental and other specialty students are summarized in Table 2.

The mean number of shisha smoking sessions and mean duration in minutes of shisha smoking sessions per day were 2.24 ± 0.8 and 65.04 ± 67.61, respectively. 78% (n = 135) of university students smoked shisha in groups and 21.99% (n = 38) smoked single. The mean age at which the students started the shisha smoking was 19.46 ± 2.97 years. Study participants had 19.5% (n = 43) of fathers and 11.8% (n = 26) of brothers in the family who were shisha smokers. The results revealed that 53.4% (n = 118) of the participants were influenced by friends, followed by 7.7% (n = 17) relatives, 5.4% (n = 12) direct family members, and 0.9% (n = 2) brothers. Of the overall shisha smokers, 69.7% (n = 154) smoked shisha at cafés while only 8.1% (n = 18) smoked at home. More than half (55.2% [n = 122]) of the smokers' parents were unaware of their shisha smoking habit.

The mean total knowledge score about the ill effects of shisha smoking on systemic and oral health was 5.30 ± 2.33. The percentage of those with knowledge

Table 2: Prevalence of shisha smoking and its distribution among dental and other specialty university students

	Frequency (%)
Dental students	81 (21.83)
Others	290 (78.17)
Total number of university students	371 (100.0)
Nonsmokers	150 (40.43)
Tobacco smokers	221 (59.57)
Total	371 (100.0)
Dental students	46 (20.81)
Others	175 (79.19)
Total tobacco smokers	221 (100.0)
Shisha smokers	122 (32.88)
Cigarette smokers	48 (12.94)
Both shisha and cigarette smokers	51 (13.75)
Total tobacco smokers	221 (59.57)
Overall prevalence of shisha smoking	173 (46.63)
Overall prevalence of cigarette smoking	99 (26.68)
Dental students	79 (45.66)
Other specialty	94 (54.34)
Total shisha smokers	173 (100.0)

about the ill-effects of shisha smoking was only 44.2% among study participants. The mean knowledge scores were significantly lower in shisha smokers in comparison to cigarette smokers and those who smoked both [Table 3]. The results also showed that there was no statistically significant difference in the mean total knowledge score between dental (5.65 ± 2.08) and other specialty (5.21 ± 2.3) university students at $P > 0.05$. The knowledge scores were higher in non-shisha smokers (7.52 ± 2.20) than those who smoked shisha in 1–2 sessions per day (6.71 ± 1.67) and >2 sessions per day (5.64 ± 2.61) and also lower in the individuals who had 1–2 sessions of shisha smoking than those had >2 sessions per day [Table 4]. There was no significant difference in the knowledge score between the individuals who smoked shisha individually (6.32 ± 2.83) and in group (6.55 ± 2.57) [Table 5]. The knowledge scores were lower in the participants who had their brothers (5.61 ± 2.50) and father (5.19 ± 2.74) smoked shisha that those who did not have smoker relatives (6.78 ± 2.28) [Table 6].

Table 3: Mean total knowledge score among the shisha smokers, cigarette smokers, and both

	n	Mean±SD	SE	95% CI for mean		*P*
				Lower bound	Upper bound	
Shisha	122	4.59±2.060	0.187	4.22	4.96	0.000
Cigarette	48	6.50±2.475	0.357	5.78	7.22	
Both	51	5.88±2.224	0.311	5.26	6.51	
Total	221	5.30±2.332	0.157	4.99	5.61	

SD=Standard deviation, SE=Standard error, CI=Confidence interval

Table 4: Comparison of knowledge scores in relation to number of shisha sessions

Number of sessions	Knowledge score (mean±SD)	ANOVA	*Post hoc*
None (a)	7.52±2.20	*F*=14.573	a>b (*P*=0.026) (S)
1-2 (b)	6.71±1.67	*P*=0.001	b>c (*P*=0.001) (HS)
>2 (c)	5.64±2.61		a=b (*P*=0.130) (NS)

S=Significant, NS=Nonsignificant, HS=Highly significant, SD=Standard deviation

Table 5: Comparison of knowledge scores in relation to shisha smoking type (individual/group)

Type	Knowledge score (mean±SD)	ANOVA	*Post hoc*
Single (b)	6.32±2.83	*F*=0.210	NS
Group (c)	6.55±2.57	*P*=0.810 (NS)	

S=Significant, NS=Nonsignificant, HS=Highly significant, SD=Standard deviation

Table 6: Comparison of knowledge scores in relation to shisha smoking by family member

Family member	Knowledge score (mean±SD)	ANOVA	*Post hoc*
None (a)	6.78±2.28	*F*=4.928	a>c (*P*=0.006) (HS)
Brother (b)	5.61±2.50	*P*=0.008	b>c (*P*=0.044) (S)
Father (c)	5.19±2.74	(HS)	a=b (*P*=0.911) (NS)

S=Significant, NS=Nonsignificant, HS=Highly significant, SD=Standard deviation

Discussion

Shisha smoking has recently been determined to be a worldwide public health risk.[4,5,31-37] It is most prevalent in Eastern Mediterranean and European countries and appears higher among youth than adults.[38] The WHO has reported the prevalence of shisha smoking among its regions as 0.8% overall, 1.6% males, 0.1% females in African region, 0.5% among adults aged ≥18 years and 8.4% among university students in the USA, 13.3%–18.9% in Middle Eastern and North African countries, and 16% in individuals aged ≥15 years in 28 countries of European Union.[35] According to Global Adult Tobacco Survey of 13 countries between 2008 and 2010, the prevalence of shisha smoking among men from highest to lowest is Vietnam (13.0%), Egypt (6.2%), Russia (4.4%), Turkey (4.0%), Ukraine (3.2%), Bangladesh (1.3%), India (1.1.%), China (0.7%), Brazil (0.2%), Thailand (0.03%), Mexico (0.02%), Uruguay (0.02%), and Philippines (0.01%).[37] A Canadian youth smoking survey 2012/2013 conducted among grade 9–12 students attending schools in 9 Canadian provinces representing 96% of Canadian population has reported the prevalence of 5.4% as currently used shisha and 14.3% ever used shisha.[5] These youth believed shisha to be less harmful than cigarette and half of these shisha users used flavored shisha.[5]

The practice of shisha (water pipe) smoking that is part of this recent global epidemic involves tobacco that is processed and flavored and indirectly heated by charcoal.[31] The average water pipe (shisha) smoking session consists of one hundred and seventy-one 530-mL puffs of 2.6 s duration at a frequency of 2.8 puffs/min.[39] Shisha smoking exposes the smoker to significant amounts of toxins such as nicotine, volatile aldehydes, CO, aromatic hydrocarbons, and tar.[8,10] A study by Shihadeh and Saleh have identified greater quantities of chrysene, phenanthrene, fluoranthene, anthracene, and pyrene apart from tar and nicotine in shisha smoke from a single smoking session of 10 g of mo'assel tobacco paste with 1.5 quick-lighting charcoal disks applied to the narghile head in relative to the smoke of a single cigarette.[8] Several authors have suggested that these toxins may increase the individual's risk for numerous deleterious health consequences such as cancer, cardiopulmonary diseases, and oral diseases such

as periodontitis.[14-16,31] However, further studies need to be conducted to verify these assumptions. Exposure to secondhand smoke from shisha pipes may also pose a serious health risk to nonsmokers and require further investigation.[40]

In this cross-sectional descriptive study, consisting of 371 university students, the prevalence of shisha smoking (46.63%) was higher than that of cigarette smoking (26.68%). This prevalence for shisha smoking, however, was lower than the one found in a recent study conducted by Al Moamary *et al*. among high school students in Saudi Arabia.[41] Their study revealed much higher prevalence of shisha smoking (65.9%) among male students.[41] The fact that these authors found such a high incidence of shisha smoking among high school students is alarming and poses the question of whether this habit is continued into adulthood. Although prevalence results of this current study are much lower than the Al Moamary *et al*.[41] Study, they are nevertheless much higher those found in a recent study of male students in the eastern region of Saudi Arabia conducted by Taha *et al*.[42] Reporting a prevalence of only 12.6%. The increased prevalence in this current study may be due to the social acceptance of shisha smoking among the Saudi Arabian Population. The false perception that shisha smoking is less lethal and toxic than cigarette smoking may be one of the factors that influence users to think it a safe alternative to cigarette smoking. Another study by Omotehinwa *et al*. has reported the prevalence of 26.1% among university students with poor knowledge about its impact on health.[43]

The lack of knowledge about the deleterious effects of shisha smoking are evidenced by the results of this current study which revealed knowledge score of 44.2% about the impact of shisha smoking on both systemic and oral health. A similar study by Wong *et al*., has gained insight into the respondents' attitude toward shisha smoking revealed the erroneous perception that shisha is healthier than tobacco cigarettes and that ignorance of the health hazards of shisha was common.[44]

Interestingly, the knowledge scores were much lower in shisha smokers than those who smoked cigarettes but no differences among the dental and other specialty students. The lack of a structured syllabus that incorporates this topic into dental and other specialty programs, along with the absence of awareness programs and intervention policies, may be factors that contribute to the lower knowledge and misconception among these university students. In addition, there is a lack of scientific evidence relating to shisha smoking in spite of the rise in its prevalence.

As reported earlier, there was no significant difference in the prevalence of shisha smoking between dental and other specialty students. Thus, there appears to be a need for the incorporation of measures to enhance both knowledge and awareness about the dangers of shisha smoking for both dental and other specialty students. The lack of knowledge is associated with higher shisha smoking sessions among university students than those who had a better knowledge. However, knowledge scores were similar in the students who smoked individually or in group.

The results of this study also revealed that shisha smoking among family members and friends influenced the onset and prevalence of this habit with this group of university students. The knowledge about ill effects of shisha smoking was lesser in the students who had their father and/or brothers smoked shisha indicating the lack of knowledge among the family members. These findings suggest the impact that family and social surroundings have on these individuals in developing these deleterious habits. Al-Rawi *et al*. have shown that peer pressure ("friends smoke shisha") followed by smoker siblings had an increased risk of being a current smoker.[45]

However, in contrast to this finding, study participants also reported that most smoked shisha in café's and their parents were not aware of their habit. Furthermore, these findings are consistent with a previous study by Aurangzeb *et al*. which investigated the perception and practices of shisha smoking among medical students.[2] That study reported that more than half of the students used to smoke shisha in a shisha bar and most of the students started smoking shisha because their friends smoked.[2]

Of particular interest, the current study found the mean starting age of shisha smoking to be 19 years of age which is in contradiction to the results of the Al Moamary *et al*. study[41] that found an almost 66% prevalence among high school students. One would assume that high school students who smoked shisha would continue with the habit once in university. However, this finding was similar to that found in the national survey of Saudi Arabia that the mean age of shisha smoking initiation was 19.1 years.[46] These findings place demands on parents, family members, and educators to be more socially responsible and to take steps toward prevention and eradication of shisha smoking habits by young students.

There is a significant increase in the prevalence of shisha smoking among youth which has become a growing concern globally.[35,37] This can be attributed to the lack

of awareness about deleterious effects of shisha smoking, flavored shisha, social acceptability due to café and restaurant culture, and inadequate regulation policies.[35] The introduction of global communication and network systems has led to the spread of shisha use, a local trend from the Middle East to regions with little or no knowledge of shisha use.[35] The findings of this study highlight the lack of knowledge and awareness about this global phenomenon of shisha smoking and its negative impact on young population especially university students. Health promotion interventions are needed that focus on debunking the myths that contribute toward a reduced perception of harm.[47] Public health education and better-informing practitioners about the facts of shisha smoking exposure might correct the false concept of "safe smoking."[45]

Comprehensive literature review and young age group of university students as target group with research question addressed in short space of time are the strengths of this study. The major limitations of this study were its relatively small sample size and in particular, exclusion of female students. Another limitation was that this was a convenience sample of university students only. Other shisha smokers in cafes and restaurants were not included in the study. Thus, the authors recommend further longitudinal studies to be conducted to assess the prevalence of shisha smoking in the general population including the female participants and clinical studies to determine its effects on oral health including periodontal health.

Conclusions and Recommendations

The high prevalence of shisha smoking among university students found in this study is alarming. The consequences that may occur among the younger population from this deleterious habit are the result of misconceptions, lack of awareness programs and policies controlling shisha smoking. These authors recommend the implementation of preventive programs highlighting the ill effects of shisha smoking on oral and systemic health among university students. It is also recommended that this topic be incorporated into the dental school syllabus so that dental professionals are better prepared to assume responsibility in the control and management of this social stigma more effectively.

Acknowledgment

The authors would like to express their gratitude to Dr. Samer Al-Jetaily, Ex-vice dean, Buraydah College of dentistry and Dr. Ahmad Al-Shara, Ex-HOD, Buraydah College of dentistry for their unconditional support.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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