Original Article

Prevalence and Predictors of Water Pipe (Shisha) Use among Iranian High School Children

Mahtab Mohammadi[1], Lekhraj Rampal[1], Sherina Mohd Sidik[2], Normala Ibrahim[2], Hejar Abd. Rahman[1], Ali Ghaleiha[3]

1 Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
2 Department of Psychiatry, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
3 Department of psychiatry, Faculty of Medicine, Hamedan University of Medical Sciences, Iran

ABSTRACT

Introduction: Water pipe use is becoming increasingly common among Iranian adolescents. This study examined the prevalence and predictors of water pipe use among public high schoolchildren aged 14-17 in Iran. **Methods:** A cross-sectional study was conducted among 1st, 2nd and 3rd grade public high schoolchildren in Sanadaj City, capital of Kurdistan province of Iran during the academic year 2012-2013. Cluster sampling was used to select a sample from 8 public high schools. The data were collected using validated self-administrated questionnaire that included questions on water pipe use, socio-demographic characteristics, smoking-related knowledge, attitude toward smoking, normative believes regards perceived prevalence water pipe use among peer and adults, perception of harm, self-esteem and refusal skill. A multivariate logistic regression analysis was performed to assess predictors of water pipe use. **Results:** A total of 1837 students participated in this study. Students' ages ranged from 14 to 17 years (mean age±15.09; SD±0.82 years). The overall prevalence of ever water pipe use was 36.2% (43.1% in male and 29.2% in female, (p<0.001). Age, gender, living arrangement, pocket money, academic grade, parental history of smoking, attitude, and normative believes regards perceived prevalence water pipe use among peer and adults were predictors of water pipe use among study participants. **Conclusions:** The overall prevalence of water pipe is high among high school children in Sanandaj. Age, gender, pocket money, academic grade, parents smoking, attitude toward smoking and normative believes were identified as the most important predictors increasing the risk of water pipe use in the studied students.

Keywords: Water pipe use, Prevalence, Predictors of Water Pipe, High school children

Corresponding Author
Mahtab Mohammadi_
Tel: +98918372349
E-mail: mahtab502@gmail.com

INTRODUCTION

Tobacco use remains a serious threat to public health globally and smoking-related diseases are considered the world's most preventable cause of mortality and morbidity (1). Worldwide, tobacco use causes about 6 million deaths per year, and current trends show that tobacco use will cause more than 8 million deaths annually by 2030 (2). The latest worldwide outspread of water pipe use by adolescents and young adults to smoke tobacco poses a new challenge for the tobacco control (3). The increasing water pipe use is a burgeoning public health crisis and is associated with

multiple health problems, including addiction, various cancers and pulmonary disease (4, 5). Water pipe is a device used for smoking tobacco involves passing tobacco smoke through water before inhalation (6). The common structure of the device that used for water pipe smoking is shown in Figure 1. One session of water pipe use contains approximately 200 puffs of smoke, which exposes water pipe users to 3- to 6-fold higher levels of carbon monoxide and 46-fold higher levels of tar than from a single cigarette (7). Today water pipe tobacco comes with variety of flavours which results for users to have lots of alternative. These various flavours which are highly popular are used among many people without taking into account its consequences. This popularity of water pipe use might be partially due to misconceptions about the harmful effects of water pipe smoking and social acceptability of the practice, as compared with cigarette smoking (8, 9).

Although cigarette smoking is the dominant form of tobacco use in most parts of the world, water pipe use accounts for a significant and growing share of tobacco use globally. It is most prevalent in Asia, Africa and the Middle East, but it is a rapidly emerging problem in other continents. In the WHO Eastern Mediterranean Region, water pipe use has surpassed cigarette use in some countries, with growing use by both men and women and, most seriously, among young people and children (10). In Iran, the prevalence of smoking any tobacco product among adolescents male and female aged 13–15 years old is 33% and 20% respectively. Out of these, only 5.1% of male and 0.9% of female are current tobacco smokers (11). Recent studies indicated an increasing trend in water pipe use and its popularities among Iranian children and adolescents (12). Out of 11 million cigarette and water-pipe smokers in Iran, 5 million are cigarette smokers, meanwhile 6 million are water pipe smokers. The popularity of smoking cigarette is much more among Iranian men compared with other tobacco products. However, among Iranian women use of water-pipe is the most common form of tobacco consumption (13). A study among Iranian high school students aged 15-17 years showed 21.6 % were ever water pipe smokers, and 9.7 % were current water pipe smokers (14). Although studies have begun to examine water pipe use among adolescents, the related socio-behavioural risk factors are largely unknown. The objective of this study is to determine the prevalence of water pipe use and its related factors among Iranian high school children.

MATERIALS AND METHODS

Design and sample
This is a cross-sectional study conducted in Sanandaj city on high school students grade one to three from October to December 2012. Sanandaj is the capital of Kurdish Culture and the Iranian province of Kurdistan. Sanandaj lies at a distance of 512 km from Tehran, north- western Iran, near the borders of Iraq. Figure
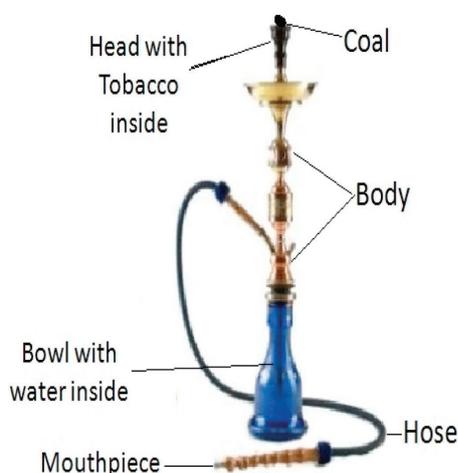
2 shows the study location of this study. The basic education is divided into a one year pre-school (5 years old), five-year primary school (6-10 years old), a three-year middle school also known as the guidance school from the sixth to the eighth grade (11-13 years old) and 4 year high school, for which the last four years is pre-university and not mandatory (14-17 years old).

Sanandaj has a total 37 public high schools (18 male and 19 female public high schools). Private schools were excluded mainly because of the smaller number of students in these schools and various logistical arrangements. Students were selected through a one stage cluster-sampling technique. From 2 educational districts in Sanandaj, 2 male and 2 female high schools were selected randomly in each district. Finally, from 8 randomly selected school all students in grade one to three were invited to participate.

In the absence of previous data on water pipe use among adolescents in the study area, an estimated prevalence of 50% was used to arrive sample size of 1260 (n = [1.96]2 × 0.50 × 0.50/[0.03]2) multiply by 20% nonresponse/absenteeism students considering 95% confidence level and ±0.3 precision. Cluster effect of 1.4 was also added and the ultimate size of the sample was estimated to be 1764 students.

Data collection
Data collection was conducted in the classroom during regular school hours and supervised by trained assistants without the presence of teachers. Persian version of anonymous and confidential self-administered questionnaire (answered by the respondents themselves) was used in this study. Participants were ensured of anonymity and confidentiality throughout the study. All question items were translated into Persian, which was verified by back-translation performed by a different professional person. The questionnaire was pretested

Figure 1. The structure of a water pipe device.
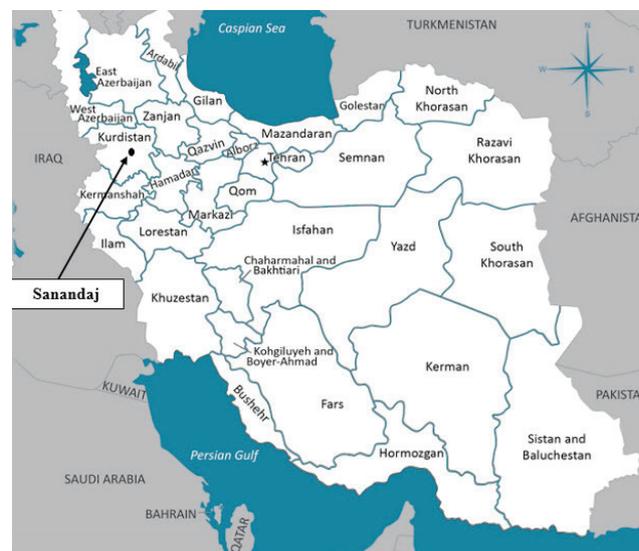
Fiqure 2. The Study Location

and validated for content and face validity among 54 students from two schools not selected for the study. The internal consistency was measured by using the Cronbach's alpha test. The results showed that the least Cronbach's alpha value was 0.79 and the highest was 0.94.

The questionnaire consisted of three sections. Section A consisted of nine socio- demographic items (gender, age, school grade, living arrangement, father's education, mother's education, monthly pocket money and academic grades on the final examination in the past year and smoking behavior of parents). Section B consisted of information on water pipe use and age when first tried water pipe use. This section was adopted from the Global Youth Tobacco Survey (GYTS), 2013. Ever used water pipe was defined as reporting ever use water pipe at any time in life. Section C consisted of six parts to assess determinant factors of water pipe use: (a) smoking-related knowledge, which consisted 13 questions adopted from the instruments in previous variety studies and modified to meet the objectives of this study (15), (b) fourteen items on attitude toward smoking, most items were retrieved from the Global Youth Tobacco Survey (GYTS), EDDRA data bank, EU-Dap questionnaire (SDG), (c) normative beliefs regarding the perceived prevalence of water pipe use among peers and adults, a five point scale ranging from 1 (none) to 5 (all of them) was used to measure the subjects' perception about "how many people their age they perceived used water pipe" and "how many adults they perceived smoked water pipe", (16) (d) the Rosenberg's general self-esteem scale which is consisted of ten items related to overall feelings of self-worth or self-acceptance. Rosenberg's (1965) self-esteem scale is the most popular measures of global self-esteem. The items are answered on a four-point scale ranging from strongly agree to strongly disagree, (17) (e) perception of harm and (f) refusal skill, a five point Likert-type scale ranging from 1 (definitely would), 2 (Probably would), 3 (not sure), 4 (probably would not) and 5 (definitely would not) assessing the probability that students will use various refusal techniques, if offered to smoke (16).

Ethics
The study protocol was reviewed and approved by the Ethic Committee for Research Involving Human Subjects (JKEUPM) of UPM (Reff no: UPM/FPSK/100-9/2-JKEUPM (JKK_Jan (12)06) and Kurdistan State's General Department of Education (Reff no: 5800/54058/5300). To conduct the study permission was also obtained from Sanandajs' Directorate of Education and headmasters of selected schools. Written informed consent was obtained from the parents and students before the conduct of the study.

Statistical analysis
Statistical analyses were performed using IBM SPSS Statistics version 21. Prior to the conduct of any analysis, all variables were examined to check normality trend, missing value, outliers through descriptive frequencies and graphs (histogram and scatter plot). Descriptive analysis of socio-demographic variables and smoking characteristics were presented as frequencies and percentages. Means and standard deviation (SD) were presented for each summed score. Multivariate logistic regression analysis was used to assess the factors associated with water pipe use. Variables found to be significantly associated in univariate analysis were considered in the multivariable models employed to identify factors associated with water pipe use. Univariate logistic regression was used to determine the crude odd ratio and variables with p value < 0.25 were entered into the multivariate logistic regression model to determine significant predictors to water pipe use in the high school children. The crude odds ratio (cOR) was the unadjusted measure of association between an exposure and an outcome. The multivariate logistic regression analysis provided the adjusted odds ratio (aOR). A p value less than 0.05 in the multivariate logistic regression analysis was considered statistically significant. The results were interpreted based on the obtained adjusted odds ratio and p value.

RESULTS

The background characteristics of the respondents are presented in Table 1. A total of 1887 students were eligible to participate; however only 1837 (97.3%) students participated in the study, of whom, 50.7% were male. The overall mean age of the respondents was 15.09 years (mean=15.09±0.82; range=14–17, 95% CI 15.09–15.14). Majority (40.9%) were in grade two followed by 30.1% grade one and 29.0% grade three. Over 91.8% (n=1686) of the respondents reported that they lived with both of their parents. Most of the parents of the students had no higher education. Only 15.4% of their fathers and 5.7% of their mothers had education of college or university, while the highest completed education for the majority of the parents was only primary and middle school. With regard to parental smoking, respondents reported that 12.3% of their parents smoked water pipe.

Table 2 shows the factors that are associated with water pipe use. The results showed that 36.2% (n=653) of the students reported to have ever used water pipe. The prevalence (43.1%) of male water pipe smokers was significantly higher (p<0.001) than the females water pipe smokers (29.2%). Amongst the 653 participants who reported ever tried water pipe, their mean age of first try was 13.5 years (mean=13.52±2.35; range=8-16). Those who were 17 years old had the highest prevalence of water pipe use (55.1%). However, the number in this group was small. The prevalence of water pipe use was higher among those who did not live with their parents (51.7%). Students who had low academic grade were more smoked compared to those

Table 1. Socio-demographic characteristics of the respondents

Variable		Frequency	Percent
Gender	Male	932	50.7
	Female	905	49.3
Age (years)	14	495	26.9
	15	728	39.6
	16	564	30.7
	17	50	2.8
Grade	One	553	30.1
	Two	751	40.9
	Three	533	29.0
Living arrangement	Both of my parents	1686	91.8
	My mother only	76	4.1
	My father only	17	0.9
	Grandparents	19	1.1
	Other relatives (s)	39	2.1
Father's education	No education	205	11.2
	Primary education	583	31.8
	Middle	427	23.3
	Secondary education	339	18.5
	College/university	279	15.2
Mother's education	No education	596	32.5
	Primary education	631	34.5
	Middle	303	16.5
	Secondary education	198	10.8
	College/university	104	5.7
Pocket money (IRR/month) *	<100000	672	40.4
	1000000- 2000001	334	19.5
	2000002-3000001	295	17.9
	>3000001	368	22.2
Academic grade	Grade A	1302	70.9
	Grade B	412	22.4
	Grade C	99	5.4
	Grade D	23	1.3
Parents smoking water pipe	Yes	223	12.3
	No	1477	81.8
	Not available	137	5.9

IRR= 0.00034 USD

that have higher academic grads (69.6%). Parental smoking and pocket money more than 300000 Rials per month was significantly associated with water pipe use among students (63.9% and 45.9%, respectively). There was significant association between water pipe use and attitude toward smoking, normative beliefs, perception of harm, self-esteem and refusal skill.

The results of univariate logistic regression analysis showing the unadjusted odd ratio are presented in Table 3. The results indicated that male gender (cOR 1.84; 95% CI, 1.51-2.24), older age (cOR 2.88; 95% CI, 1.59-5.24), living with grandparents/others (OR 1.95; 95% CI, 1.15-3.29), having monthly pocket money more than 300,000 Rials (cOR 1.75; 95% CI, 1.34-2.27), lower

Table 2. Factors associated with water pipe use

Characteristics		Ever water pipe use (%)	Never water pipe use (%)	Test- statistics	P-value
Gender	Male	391(43.1)	517(56.9)	χ2 =37.7	<0.001*
	Female	262(29.2)	639(70.8)		
Age (years)	14	145(29.8)	341(70.2)	χ2 =19.2	<0.001*
	15	262(36.3)	459(63.7)		
	16	219(39.8)	331(60.2)		
	17	27(55.1)	22(44.9)		
Living arrangement	Both of parents	588(35.5)	1070(64.5)	χ2 =6.7	0.035*
	Mother /father only	35(38.9)	55(61.1)		
	Grandparents/others	30(51.7)	28(48.3)		
Father's education	No education	82(41.2)	117(58.8)	χ2 =6.2	0.179
	Primary education	202(35.3)	371(64.7)		
	Middle	162(39.0)	253(61.0)		
	Secondary education	109(32.2)	229(67.8)		
	College/university	97(35.0)	180(65.0)		
Mother's education	No education	195(33.6)	385(66.4)	χ2 =4.7	0.313
	Primary education	222(35.7)	399(64.3)		
	Middle	115(38.2)	186(61.8)		
	Secondary education	82(41.6)	115(58.4)		
	College/university	37(36.3)	65(63.7)		
pocket money (Rials/month)	<100000	217(32.7)	447(67.3)	χ2 =19.1	<0.001*
	1000000- 2000001	108(33.6)	213(66.4)		
	2000002-3000001	107(36.5)	186(63.5)		
	>3000001	167(45.9)	197(54.1)		
Academic grade	Grade A	401(31.4)	878(68.6)	χ2 =53.6	<0.001*
	Grade B	182(44.7)	225(55.3)		
	Grade C	54(56.2)	42(43.8)		
	Grade D	16(69.6)	7(30.4)		
Parents smoking water pipe	One or both parents smokers	191(63.9)	108(36.1)	χ2 =119.6	<0.001*
	No	461(30.6)	1045(69.4)		
Smoking-related knowledge (Mean±**SD)**		7.35 ± 2.7	7.61±3.0	t=1.86	0.063
Attitude toward smoking (Mean±SD)		54.12 ± 7.3	58.23±6.7	t=11.76	<0.001*
Normative beliefs (Mean±SD)		5.01 ± 1.4	6.10±1.2	t=16.71	<0.001*
Perception of harm (Mean±SD)		9.57 ± 1.9	10.23±1.9	t=6.45	<0.001*
Self-esteem (Mean±SD)		27.13 ± 4.3	27.65±4.3	t=2.41	0.016*
Refusal skill (Mean±SD)		24.23 ± 6.2	25.49±6.9	t=3.91	<0.001*

Note: χ2=chi square, t = t-test, *Significant at level p<0.05

academic grade (cOR 4.99; 95% CI, 2.04-12.23) and having one or both parents smoking (cOR 4.01; 95% CI, 3.08-5.19) lead to a higher risk of susceptibility to use water pipe. The students were less likely to use water pipe if they had negative attitude toward smoking (OR 0.92; 95% CI, 0.91-0.94), those who perceived that the prevalence of water pipe use among adolescents and adults are low (cOR 0.55; 95% CI, 0.51-0.60), those having low self-esteem (cOR 0.97; 95% CI, 0.95-0.99) and low refusal skill (cOR 0.98; 95% CI, 0.96-0.97).

Table 4 displays the results of the multivariate logistic regression analysis. Compared to females, water pipe use was significantly 1.73 times higher among males (aOR

Table 3. Univariate logistic regression analysis

Characteristics		Crude OR	95% CI	P- value
Gender	Female	1		
	Male	1.84	1.51-2.24	<0.001*
Age (years)	14	1		
	15	1.35	1.05-1.72	0.02*
	16	1.56	1.20-2.01	0.01*
	17	2.88	1.59-5.24	<0.001*
Living arrangement	Both of parents	1		
	Mother /father only	1.56	0.75-1.79	0.51
	Grandparents/others	1.95	1.15-3.29	0.01*
Father's education	No education	1		
	Primary education	0.78	0.56-1.08	0.28
	Middle	0.91	0.65-1.29	0.91
	Secondary education	0.96	0.67-1.31	0.67
	College/university	0.78	0.62-1.22	0.76
Mother's education	No education	1		
	Primary education	0.89	0.57-1.38	0.60
	Middle	0.98	0.63-1.52	0.93
	Secondary education	1.08	0.68-1.73	0.73
	College/university	1.25	0.76-2.05	0.37
pocket money (Rials/month)	<100000	1		
	1000000- 2000001	1.04	0.78-1.20	0.76
	2000002-3000001	1.19	0.89-1.59	0.22*
	>3000001	1.75	1.34-2.27	<0.001*
Academic grade	Grade A	1		
	Grade B	1.76	1.41-2.22	<0.001*
	Grade C	2.81	1.85-4.27	<0.001*
	Grade D	4.99	2.04-12.23	<0.001*
Parents smoking water pipe	No	1		
	One or both parents smokers	4.01	3.08-5.19	<0.001*
Smoking-related knowledge (Mean±**SD)**		0.97	0.94-1.02	0.26
Attitude toward smoking (Mean±SD)		0.92	0.91-0.94	<0.001*
Normative beliefs (Mean±SD)		0.55	0.51-0.60	<0.001*
Perception of harm (Mean±SD)		0.85	0.81-0.89	<0.001*
Self-esteem (Mean±SD)		0.97	0.95-0.99	0.016*
Refusal skill (Mean±SD)		0.98	0.96-0.97	<0.001*

*Significant at level p<0.25

1.73; 95% CI, 1.33-2.66). The risk of water pipe use is found to increase with increasing age of the students, and a significant positive association was found among those aged 17 years (aOR 2.19; 95% CI 1.99-4.81). Students who lived with grandparents/ others were two times more likely to use water pipe compared to those who lived with both of parents or at least one of them (aOR 2.02; 95% CI, 1.99-4.81). The results indicated that the risk of water pipe use was significantly increased among adolescents with lower academic grades (aOR 1.94; 95% CI, 1.42-3.34), those hiving one or both parents smoking (aOR 2.99; 95% CI, 2.14-4.18), those reported having monthly pocket money more than 300000 Rials (aOR 1.75; 95% CI, 1.27-2.43). Adolescents who had

Table 4. Multivariate logistic regression analysis

Characteristics		Adjusted OR	95% CI	P- value
Gender	Female	1		
	Male	1.73	1.33-2.26	<0.001*
Age (years)	14	1		
	15	1.29	0.94-1.78	0.11
	16	1.44	1.03-2.02	0.03*
	17	2.19	1.99-4.81	0.04*
Living arrangement	Both of parents	1		
	Mother /father only	1.36	0.78-2.35	0.26
	Grandparents/others	2.02	1.02-4.01	0.04*
pocket money (Rials/month) *	<100000	1		
	1000000- 2000001	1.05	0.75-1.48	0.76
	2000002-3000001	0.93	0.65-1.33	0.71
	>3000001	1.75	1.27-2.43	0.001*
Academic grade	Grade A	1		
	Grade B	1.32	0.97-1.78	0.07
	Grade C	1.85	1.03-3.34	0.04*
	Grade D	1.94	1.42-4.31	0.03*
Parents smoking water pipe	No	1		
	One or both parents smokers	2.99	2.14-4.18	<0.001*
Attitude toward smoking		0.96	0.93-0.97	<0.001*
Normative beliefs		0.60	0.55-0.67	<0.001*
Perception of harm		0.95	0.89-1.01	0.157
Self-esteem		0.98	0.95-1.02	0.239
Refusal skill		0.99	0.97-1.01	0.571

*Significant at level p<0.05

negative attitude toward smoking were less likely to use water pipe (aOR 0.96; 95% CI, 0.93-0.97). The risk of water pipe use was reduced among adolescents who perceived that the prevalence of water pipe use among adolescents and adults are low (aOR 0.60; 95% CI, 0.55-0.67).

DISCUSSION

This study presents the prevalence and associated factors with water pipe use among public high school children in Sanandaj. The results demonstrate that thirty-six percent of the participants had ever smoked water pipe, which is higher than the finding of prior studies among Iranian adolescents (18, 19). One possible explanation could be that there is cultural tolerance for water pipe smoking in Iranian families (20). Moreover, its popularity could be ease of use in different social settings, such as coffee shops and restaurants, a variety of choices in types and fragrances of water pipe, the relatively cheaper price and therefore affordability (19).

Results revealed that male gender was associated with water pipe use. Male students were 1.7 times more likely to use water pipe than girls. The same results have been found in Iran (19) and in studies carried out among high school students in Oman (21). This finding is inconsistent with previous studies in Jordan that water pipe is more prevalent among girls (22) and developed countries which the difference between male and female prevalence is smaller (23, 24). This study also found an association between age and water pipe use. An increase in age increased the odds of smoking. This result supports previously reported studies noting that as youth age, they are more likely to engage in water pipe tobacco use (22). Mean age of first water pipe smoking was 13.5 years (SD ± 2.35years). This finding raises concerns regarding the health problems of water pipe use among adolescents, and emphasize the need to address the factors that cause water pipe use among adolescents.

The results indicated that parental smoking was associated with water pipe use among high school

students. This finding is consistent with the results of another study carried out among Arab-American high school students which found that if one or more family members smoked water pipe in the home, adolescents were 6.3 times more likely to be current water pipe smokers (27). Furthermore, other studies indicated that adolescents are more likely to smoke water pipe if they had a parent who smoked water pipe or cigarettes (21, 25).

Ever water pipe use was two times more likely among those students who lived with grandparents and other relatives. The students who were living with their relatives reported smoking significantly more often than those living with their both parents or even one of them. The present study also highlights the association between water pipe use and amount of pocket money. Students who received pocket money of more than 300000 IRR/month had higher odds of water pipe use than if their pocket money was lower. This may suggest that having more money may have encouraged the adolescents to initiate and maintain their smoking habit. Al-Lawati et al, reported similar findings with water pipe use being associated with receiving higher amount of pocket money (21). The results also showed an inverse association between water pipe use and academic achievement. This study showed that water pipe smoking is more strongly associated with low academic achievement. One possible explanation could be that water pipe smoking consumes a greater deal of time; therefore, use of water pipe detracts from time available for academics and, hence, poor academic achievement (26). The present study also highlights the association between positive attitude toward smoking and water pipe use. In a systematic review, most of the studies found that the majority of people perceived water pipe smoking as less harmful than cigarette smoking and more socially acceptable than cigarette smoking in general (28).

Students in the current study were more likely to use water pipe when they perceived that prevalence of water pipe use among their peer and adults are high. The perceived prevalence of smoking, which is a more common measure of normative views, was positively associated with water pipe use. This is also consistent with a previous research on perceived peer smoking prevalence and its association with smoking behaviors and intentions in Hong Kong Chinese adolescents (29). This suggests that tobacco use is more likely to be influenced by normative views that include some level of value assessment than simply by the notion that many people smoke (30).

The major strength of this study was a large sample size and high response rate. Use of anonymous data collection instruments was also an important strategy to prevent desirability effect that creates demand for favorable response from the respondents. However, limitations associated with the use of self-answered questionnaires need to be considered, which subject the findings to self-report bias. Any form of tobacco use of adolescents is prohibited and is a sensitive topic that many adolescents are reluctant to talk about. Furthermore, this study only focused on the adolescents attending public high schools in urban areas. Private schools and adolescents who do not attend school were not included in this study. That also limited the findings of this study.

CONCLUSIONS

According to findings in the present study, the overall prevalence of water pipe in high schoolchildren in Sanandaj, Iran is 36.2% (34.5% of males and 29.2% of females). Age, gender, pocket money, academic grade, parents smoking, attitude toward smoking and normative believes regards perceived prevalence water pipe use among peer and adults were identified as the most important predictors increasing the risk of water pipe use in the studied students. Thus, design and implementation of interventions programs considering these predictor factors may be effective in preventing water pipe use among adolescents.

ACKNOWLEDGEMENTS

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