

Evaluation of Dual Tobacco Smoking (Water Pipe and Cigarettes) and Associated Factors in Adults in Tehran

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Background: Concurrent use of tobacco products such as cigarettes and water pipes may be associated with increased risk of nicotine dependence and smoking-related complications. Accurate statistics are not available regarding the prevalence of water pipe use or concurrent use of cigarettes and water pipe in the Iranian population. Thus, this study sought to assess the prevalence of concurrent use of cigarettes and water pipes and their related factors in Iran.

Materials and Methods: This cross-sectional study was conducted on Tehran residents over 15 years of age, who were selected via cluster, multi-stage randomized sampling, from different geographical districts of Tehran between November and December 2014. The data were collected using the water pipe section of the Global Adult Tobacco Survey (GATS) questionnaire.

Results: A total of 1,830 individuals participated in this study, 243 (13.3%) of which exclusively used water pipes, 76 (4.2%) used both cigarettes and water pipes, and 120 (6.6%) exclusive smoked cigarettes. Of those who used both cigarettes and water pipes, 86.8% were men and 13.2% were women ($P < 0.001$). The mean age of those who only used water pipes was 28.01 ± 8.7 years while the mean age of those who used both water pipes and cigarettes was 33.1 ± 1.1 ($P < 0.001$). Male sex (adj. OR: 3.8) and older age (adj. OR: 1.06) increased the odds of using both tobacco products.

Conclusion: The prevalence of concurrent use of cigarettes and water pipes and that of exclusive water pipe use were 4.2% and 13.3%, respectively. The prevalence of exclusive cigarette smoking was 6.1%. Those who smoked both cigarettes and water pipes had a higher mean age than those who exclusively used water pipes and they were mostly men. Among those who used cigarettes and water pipes, the mean age at which they began using water pipes was lower than the mean age at which they began smoking cigarettes. In other words, dual smokers started water pipe smoking sooner than cigarette smoking. Future studies with different methodologies are required to further scrutinize the relationship between water pipe and cigarette smoking. Smoking cessation programs must specifically target dual smokers.

Key words: Cigarette smoking, Water pipe smoking, Risk factors

INTRODUCTION

Water pipe (hookah) smoking is a traditional method of tobacco consumption dating back to the 16th century in India. Water pipe smoking later became customary in the

Middle East and now many individuals believe that water pipe smoking originated in the Middle East. The appearance of water pipes has changed over time to that of the currently used models (1,2). Tobacco smoke in a water

pipe passes through water before being inhaled by the consumer (3). This has led to the wrong belief that water filters the smoke and eliminates its toxic chemicals. There is a general belief that water pipe smoking is less harmful than other forms of tobacco products and is associated with lower degrees of nicotine dependence (4,5). However, numerous studies have shown that water pipe smoke contains several carcinogens, heavy metals, and other toxins, and is associated with several smoking-related diseases (6). Evidence suggests that a single use of water pipe is equal to smoking 100 cigarettes in terms of the amount of toxins entering the body (7,8). Nonetheless, the prevalence of water pipe smoking is increasing worldwide, including in Europe and North America (9). Thirty percent of the participants of a study in Iran reported using water pipes (10)

A study showed that in Mediterranean countries water pipes had replaced cigarettes as the most common form of tobacco consumption (11). Some of the young water pipe smokers have never smoked cigarettes before. This finding suggests that millions of young adults are exposed to tobacco smoke via water pipes and become addicted to nicotine (6). A significant association between cigarette and water pipe smoking has been previously documented. However, sufficient evidence does not exist to support the role of cigarette smoking as a predictor of water pipe smoking in young adults (12, 13). Most young individuals initially experience tobacco by smoking water pipes, which may proceed to cigarette smoking later (4, 14, 15).

Several factors are responsible for the increasing prevalence of water pipe smoking, such as the incorrect belief regarding its safety, availability of various flavors of water pipe tobacco, and the increasing number of restaurants and coffee shops that serve water pipes as a form of leisure activity. Also, many smokers have replaced cigarette smoking with water pipe smoking or use both (11, 12).

Cigarette smoking is the most common form of tobacco consumption. However, concurrent use of cigarettes and water pipe has been on the rise in the recent years. Some smokers turn to water pipe smoking aiming to cut down

on cigarette smoking or quit all together, while some young adults who have never smoked cigarettes before routinely use water pipes (16, 17). In these individuals, water pipe smoking may eventually lead to cigarette smoking.

Concurrent use of tobacco products requires special attention because it increases the risk of nicotine dependence and smoking related complications. For instance, e-cigarettes (smokeless cigarettes) increase the nicotine intake and cause more severe signs and symptoms of nicotine dependence, which make quitting more difficult (18, 19).

This study sought to assess the prevalence of concurrent use of water pipes and cigarettes and its complications compared to using water pipes exclusively. We used the data from the water pipe section of the Global Adults Tobacco Survey (GATS) checklist to assess the factors affecting concurrent use of cigarettes and water pipes.

MATERIALS AND METHODS

This cross-sectional study was conducted on Tehran residents over 15 years of age who were selected via multi-stage cluster sampling. Sample size was calculated to be 1,845. A municipal district was randomly chosen from each geographical district of Tehran (North, South, West, East, and Center). Each municipal district includes several zones, of which two zones were randomly selected. Each zone had a health center covering the entire population of the respective zone. The address of a house was randomly chosen and the occupants of its neighboring houses were asked to participate in the study.

The study team included three members: two interviewers (one man and one woman) chosen from the workers of the health center based on their experiences and interest in research activities, as well as a supervisor from the Tobacco Prevention and Control Research Center. Health workers were briefed about the project and its objectives and were given detailed instructions regarding interviewing and data collection.

Data collection tool

The water pipe section of the GATS was used for data collection. Global Adults Tobacco Survey is a part of the world tobacco monitoring system (20). The GATS has several sections including a section on water pipe. We used the questions from that section and made some slight modifications to them in order to adapt them to Iranian culture and subsequently translated them to Farsi. The variables evaluated in this study included individuals demographic data (age, sex, level of education, marital status), water pipe smoking status, knowledge about the hazards of water pipe smoking, assessment of exposure to water pipe smoke (water pipe smoking allowed at home or not), and cigarette smoking status.

Definitions

Current water pipe smokers: Individuals who smoked water pipe daily or less frequently but reported using it during the past 30 days

Current cigarette smokers: Individuals that reported smoking at least one cigarette per day.

Exclusive water pipe smokers: Individuals who only reported water pipe smoking (who met the criteria of current water pipe smokers)

Exclusive cigarette smokers: Individuals that only reported cigarette smoking (who met the criteria of current cigarette smokers)

Concurrent smokers: Individuals that reported use of both cigarettes and water pipes (who met the criteria described above).

The frequencies of exclusive water pipe smoking and concurrent smoking of cigarettes and water pipes were calculated and the risk factors related to concurrent smoking compared to exclusive water pipe smoking were statistically analyzed.

Statistical analysis

The data were analyzed using SPSS software version 18. Descriptive statistics of quantitative variables were reported as means and standard deviations (SD) while qualitative variables were reported as percentages. The prevalence of concurrent smoking, exclusive water pipe smoking and exclusive cigarette smoking were

subsequently calculated. Chi-squared test was used to compare qualitative (nominal) variables between the two groups. Since the quantitative variables did not have a normal distribution, non-parametric Mann Whitney U test was applied to compare them between the two groups (concurrent smokers and exclusive water pipe smokers).

To determine the risk factors related to concurrent cigarette and water pipe smoking compared to exclusive water pipe smoking, significant variables in the previous tests were entered into a logistic regression model and the adjusted odds ratios (OR) were calculated for them. Level of significance was set at $P \leq 0.05$.

RESULTS

A total of 1,830 individuals participated in this study, 883 (48.4%) of which were men. The mean age of participants was 33.7 ± 1.37 years. In total, 1,391 (76%) were non-smokers, 243 (13.3%) were exclusive water pipe smokers, 120 (6.6%) were exclusive cigarette smokers, and 76 (4.2%) were concurrent smokers. Among exclusive water pipe smokers, 147 (60.5%) were men and 96 (39.5%) were women. Of dual smokers, 66 (86.8%) were men and 10 (13.2%) were women ($P = 0.000$). Demographic data for concurrent smokers as well as exclusive water pipe smokers are presented in Table 1.

Table 1. Demographic information of concurrent smokers and exclusive water pipe smokers

Variables	Exclusive water pipe smokers	Dual smokers	P value
Sex			
Men	147(60.5)	66(86.8)	<0.001
Women	96(39.5)	10(13.2)	
Level of education			
Illiterate	6(2.5)	4(5.3)	0.7
High school	67(27.7)	23(30.3)	
High school diploma	91(37.6)	29(38.1)	
University education	76(32.2)	20(26.3)	
Missing	3	-	
Marital status			
Married	120(50)	44(58.7)	0.3
Single	111(46.2)	30(40)	
Divorced or widowed	9(3.8)	1(1.3)	
Missing	3	1	

Among exclusive water pipe smokers, 43 (13.6%) reported smoking only in tea houses, 131 (54.1%) reported smoking at home, 48 (19.8%) reported smoking in parks and public places, and 30 (12.4%) reported smoking in restaurants. Of dual smokers, 20 (26.3%) reported smoking in tea-houses, 39 (51.3%) reported smoking at home, 14 (18.4%) reported smoking in parks and other public places, and three (3.9%) reported smoking in restaurants ($P = 0.021$).

The mean age of those who exclusively smoked water pipe was 28.01 ± 8.7 years, while that of dual smokers was 33.1 ± 1.1 ($P = 0.00$). In those who exclusively used water pipes, the mean number of smoking sessions per week was 4.04 ± 4.02 compared to 5.1 ± 5.3 in concurrent smokers ($P = 0.4$).

The mean age at initiation of water pipe smoking was 20.9 ± 6.3 years in those who exclusively smoked water pipes compared to 22.5 ± 6.88 years in dual smokers ($P = 0.07$). The mean age at initiation of cigarette smoking was 24.05 ± 6.6 years in dual smokers.

In general, 211 (87.2%) exclusive water pipe smokers and 62 (82.7%) dual smokers reported using flavored tobacco ($P = 0.45$).

Individuals' attitude towards- and knowledge of the health hazards of water pipe smoking are shown in Table 2. No significant difference was observed between the two groups (exclusive water pipe smokers and dual smokers) with regards to their knowledge of the health hazards of water pipe smoking; a higher percentage of exclusive water pipe smokers believed that water pipe smoking was

more addictive than cigarette smoking (41.1% versus 31.6%). Also, a higher percentage of exclusive water pipe smokers believed that water pipe smoking had more adverse health effects than cigarette smoking (51.9% versus 42.1%). A higher percentage of exclusive water pipe smokers believed that water pipe smoking could cause serious diseases (60% versus 54%). The frequency of monthly water pipe use in each groups is shown in Table 3. As seen in Table 3, the monthly frequency of water pipe use was significantly higher in dual smokers compared to exclusive water pipe smokers. There were no significant differences between the two groups in terms of the number of bowls used per each smoking session. Both groups recalled starting water pipe use with friends (63.8% of exclusive water pipe and 80.3% of dual smokers) and the difference in this respect was not significant between the two groups ($P=0.09$).

In terms of exposure to water pipe smoke at home, 145 (60.7%) exclusive water pipe smokers reported smoking water pipe at home, compared to 58 (77.3%) dual smokers. A total of 28 (11.7%) exclusive water pipe smokers and 8 (10.7%) dual smokers reported that they were not allowed to smoke water pipe at home ($P = 0.029$).

Table 4 shows factors associated with dual smoking and exclusive water pipe smoking after entering the significant variables of pairwise comparisons into the logistic regression model. Male sex (OR 3.8) and older age (OR 1.06) increased the odds of dual smoking. Prohibition of water pipe smoking at home had a protective effect on dual smoking.

Table 2. Level of knowledge of the two groups of dual smokers and exclusive water pipe smokers about the health hazards of water pipe smoking

Variables	Exclusive water pipe smokers	Dual smokers	P value
Compared to cigarette smoking:			
Water pipe smoking is less addictive	48(19.7)	14(18.4)	0.3
Water pipe smoking is more addictive	100(41.1)	24(31.6)	
Water pipe smoking and cigarette smoking are equally addictive	46(19)	20(26.3)	
Do not know	49(20.2)	18(23.7)	
Compared to cigarette smoking:			
Water pipe smoking has less health hazards	33(13.6)	10(13.2)	0.36
Water pipe smoking has more health hazards	126(51.9)	32(42.1)	
Water pipe smoking and cigarette smoking have the same health hazards	40(16.5)	18(23.7)	
Do not know	44(18)	16(21)	
Water pipe smoking causes serious diseases:			
Yes	144(60)	40(54)	0.5
No	47(19.6)	19(25.7)	
Do not know	49(20.4)	15(20.3)	
Missing	3	2	

Table 3. The frequency of water pipe smoking in the two groups of dual smokers and exclusive water pipe smokers

Frequency of water pipe smoking	Exclusive water pipe smokers		Dual smokers		P value
	Number	Percentage	Number	Percentage	
More than 3-4 times a month	147	60.7	61	80.3	0.007
Once a month	62	25.3	9	11.8	
Rarely	34	14	6	7.9	

Table 4. Factors related to dual smoking based on multivariate logistic regression analysis

Factors	Dual smoking	Adj. OR	P value
Female sex	39.5%	1	
Male sex	60.5%	3.8	0.001
Age		1.06	0.00
Water pipe smoking allowed at home	60.7%	1	
Water pipe smoking not allowed at home	11.7%	0.318	0.026
No specific rule in this regard	11.3%	0.06	0.01

Based on Table 4, male sex significantly increased the odds of dual smoking. Older age also had a significant association with the odds of dual smoking (OR: 1.06). Prohibition of water pipe smoking at home had a protective effect on dual smoking.

DISCUSSION

The prevalence of dual smoking was 4.2% in our community. This value is considerably high and needs to be addressed because these individuals smoke at least one cigarette daily while using water pipes at least once daily. Only 13.3% of the participants exclusively used water pipes. The prevalence of concurrent smoking in our study was similar to the value reported in a previous study on 14 - 18 year-olds in Iran, which reported the prevalence of dual smoking to be 3.7% (21). Cobb et al. reported the prevalence of dual smoking to be 9.3% among American students. The prevalence of exclusive water pipe smoking was 6.1% in that study (22).

Tobacco use is associated with significant cardiovascular and respiratory diseases (6). Dual smoking should be addressed by health authorities and specific smoking cessation programs must be implemented as it has serious complications and causes nicotine dependence. Previous studies have shown that concurrent use of cigarettes and smokeless tobacco increases nicotine addiction and makes smoking cessation more difficult (18, 19). It also increases the incidence of smoking-related complications such as acute myocardial infarction (23).

Based on our results dual smokers were older than exclusive water pipe smokers, whereas in the study by

Cobb et al (22) the two groups were not significantly different in terms of age and most individuals in both groups were younger than 19 years of age. However, they showed that dual smokers were on average younger than exclusive cigarette smokers.

In our study, exclusive water pipe smokers were younger than dual smokers, which may be due to the relative ease with which younger individuals can access water pipes, as well as the lower price of water pipes compared to cigarettes. Given our study design, no conclusion could be reached regarding the hypothesis that early exposure to water pipes could lead to cigarette smoking in the future. The mean age at initiation was 28 ± 4 years for water pipe users and 33 ± 5 years for dual smokers. It appears that younger individuals are more interested in using water pipes exclusively, which further confirms the hypothesis that smoking starts with water pipe smoking.

Comparing the mean age of initiation of cigarette smoking and water pipe smoking in dual smokers revealed that the mean age at onset of cigarette smoking was higher than that of water pipe smoking. This indicates that dual smokers were exposed to water pipes before being exposed to cigarette smoking, which confirms the above-mentioned hypothesis. However, further studies are required to prove

this. A previous study in Lebanon indicated that water pipe smoking could lead to cigarette smoking and vice versa. However, it was previously shown that cigarette smoking was a strong predictor of water pipe smoking (24).

Our results show that prohibition of water pipe smoking at home had a protective effect on dual smokers, and those who are not exposed to water pipe smoke at home had a lower risk of dual smoking.

Our results show that even after controlling for other factors, male sex had a significant effect on dual smoking. This might be due to men's higher risk taking behavior women's higher attention to their health. However, a tendency to water pipe smoking can be seen among women in many communities due to the incorrect belief that water pipe use is less hazardous than cigarette smoking. Also, in the Iranian community, some cultural and religious barriers exist against cigarette smoking by women. Thus, the frequency of dual smoking is higher in men. However, underreporting by women should not be overlooked.

Older age was associated with higher rate of dual smoking as well. Evidence shows that young adults are highly interested in water pipe smoking and many water pipe smokers have never smoked a cigarette (4,14, 15). In a previous study, water pipe smokers who had never smoked a cigarette predicted that they would definitely start smoking cigarettes within the next five years (25). This further confirms the hypothesis that tobacco abuse starts with water pipe use and can proceed to cigarette smoking.

There was no significant difference in the knowledge of the individuals in the two groups with respect to addiction risk, and health hazards of water pipes compared to those of cigarette smoking. However, a higher percentage of exclusive water pipe smokers (60%) compared to dual smokers (54%) believed that water pipe smoking could cause serious diseases. Also, a higher percentage of exclusive water pipe smokers compared to dual smokers believed that water pipe smoking was associated with

greater health hazards than cigarette smoking. This finding may be attributed to the younger age of exclusive water pipe smokers compared to dual smokers and the fact that younger individuals may have more up to date knowledge of smoking risks.

In terms of level of education, no significant difference existed between the two groups. However, it should be noted that general knowledge does not necessarily correlate with the level of education.

Another interesting finding of our study was the significantly higher frequency of water pipe smoking in dual smokers compared to exclusive water pipe smokers. Since the former group smoked cigarettes as well, this may indicate their higher nicotine dependence. Further studies are warranted to further investigate this.

CONCLUSION

The prevalence of dual-, exclusive water pipe-, and exclusive cigarette smoking was 4.2%, 13.3% and 6.1%, respectively. These values show an increase in the prevalence of water pipe smoking and the public tendency to use water pipes. Dual smokers were older than exclusive water pipe smokers and were mostly men. Also, the mean age at initiation of water pipe smoking was lower compared to the age of initiation of cigarette smoking in dual smokers. This means that they started using water pipes before cigarettes. Future studies with different methodologies are required to further scrutinize the relationship between water pipe smoking and cigarette smoking. Also, special tobacco cessation programs should be developed for individuals who smoke both cigarettes and water pipes.

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