

# Water Pipe Tobacco Smoking Among University Students in Oman: A Cross-sectional Study

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## Abstract

Tobacco smoking and water pipe tobacco smoking (WTS) are common in the Middle East and have now spread to other parts of the world. The aim of this study was to explore the behavior, attitude, beliefs and intentions associated with WTS among university students in Oman. This is a cross-sectional, descriptive study, which was carried out at Sultan Qaboos University (SQU) and the High Technology College, both in Muscat, Oman, from August 2015 to April 2016. Participants were requested to answer an electronic or paper-based survey, which was adapted from a validated survey constructed by the American University of Beirut, adapted for WTS users. Of the 188 participants, 51.1% were younger than 23-years-old. The vast majority (85.6%) smoked WTS in a café, while 11.2% smoked at home and only 3.2% at a university accommodation. A higher proportion of WTS products were purchased from cafés (64.4%), followed by supermarkets, friends and purchased online. The most commonly used flavor was “double apple” (59.0%). Around 47.3% of the participants thought WTS was less addictive and less harmful than cigarette smoking. This study highlighted the need for a better understanding of the contributing factors and the attitudes towards WTS, which will in turn lead to prevention, as well as interventional policies, to address this emerging public health threat in Oman.

## Keywords

Water Pipe Tobacco, Smoking, Attitude, Behavior, Student, Oman

## 1. Introduction

The influence of tobacco smoking and water pipe tobacco smoking (WTS) (also known as shisha, nargila, and hookah) has long been presence in the Middle East, South Asia and is currently spreading to other parts of the world [1]. Some emerging studies have suggested a strong association between WTS and numerous poor health outcomes, including lung cancer, respiratory illnesses, low birth weight and

periodontal disease, in addition to nicotine dependence [2].

Several studies from Arab-Islamic countries have examined the magnitude of WTS, as well as its correlation, among the younger population. They studied a nationally representative sample of pupils from Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates and Yemen. They found that being males were more likely to partake in both cigarette smoking and WTS. Factors such as exposure to secondhand smoke in public places and tobacco advertisement appeared to be independent predictors of the

initiation and consumption of nicotine [3]. Conducted a survey of school children in Irbid, Jordan, noting that the rate of WTS and cigarette smoking was high among the Jordanian youth [4]. Another study reported that the youth in Jordan perceived WTS as being “easy to quit”, though the majority appeared to exhibit tobacco dependency [5]. Similar observations were made in Qatar [6]. In addition to tobacco dependency, studies have noted mood disorders, including depressive symptoms, and lower self-esteem to be common among habitual water pipe smokers in Lebanon [7]. In Egypt, Fouad *et al* conducted a study among a national representative sample of youths and observed their consumption of WTS, reporting that nearly 20% of the sample were currently using tobacco products [8]. A surveyed university students in Saudi Arabia and reported that 37% had partaken in WTS and they appeared to have limited knowledge of the adverse effects [9]. In Syrian study reports that 23.5% of their participants were WTS on a regular basis. Another study from Dubai reported that 14.6% of their sample of 2457 students were tobacco smokers.

The consumption of tobacco is forbidden as part of the Islamic culture, including Oman. Despite this, some studies have indicated that there is a rising trend of WTS in Oman. However, previous studies in Oman are limited due to their lack of focus on the behaviors, attitudes, beliefs and intentions toward WTS. Therefore, the aim of the study was to explore the behaviors, attitudes, beliefs and intention of WTS among university students in Oman.

## 2. Methods

This was a cross-sectional, descriptive study, carried out at Sultan Qaboos University (SQU), a leading research-based public university in Oman, and the High Technology College, both located in Muscat, Oman. This study was part of a multicenter study being conducted in the Middle East, led by the American University of Beirut (AUB), between August 2015 and April 2016 to cover almost the full academic year.

Consenting participants were requested to answer an electronic or paper-based survey which was developed and validated by AUB. The survey consists of 4 sections:

Section 1: Potential participants are informed about the aim of the study and survey and assured that their answers will be kept confidential and anonymous. This section will be used to check the inclusion criteria, which was stated as university students (aged 18 to 29 years old) who have smoked a water pipe.

Section 2: Participants’ social demographic data.

Section 3: This section will include questions to determine the history of WTS use, current WTS use, attitudes towards WTS, and the concurrent use of other tobacco products.

Section 4: This section of the survey will test the attitudes of participants towards text-only and text plus pictorial health warning labels tailored to WTS, and their attitudes and intentions regarding WTS.

### *Sample size calculation*

The minimum sample size required was calculated. The

formula takes into consideration the desired confidence interval ( $z$ ), the choice share for a given option ( $p$ ), the number of choice sets ( $r$ ), and the allowable margin of error ( $a$ ). For this study, we fixed the threshold for statistical significance at  $z = 1.96$ , which reflects a Bonferroni-corrected alpha of .025 (.05/2), to account for the 2 blocks. The experimental design consists of 9 choice sets,  $r = 9$ . Since each choice set has five options (four hypothetical WTS experiences and an opt-out alternative, “none of the above”),  $p = 1/5 = 0.20$ ; and “ $q$ ” is defined as  $1-p$ ,  $q = 0.80$ . The allowable margin of error is set at 10%, commonly used margin representing the allowable deviation between the estimated choice share “ $p$ ” and the true choice share observed in the population,  $a = 0.1$ . This formula leads us to a minimum sample size of 171 per block<sup>13</sup>.

### 2.1. Data Collection

Data were collected during campaigns conducted at SQU and the High Technology College. Students were asked to participate in the electronic survey using their phones, tablets or computers, with hard copy questionnaires also being made available. Participants who had difficulty in accessing the online questionnaire were given the hard copy to answer and their responses were entered into the database by a research assistant. Only those who fit the inclusion criteria completed the survey. Candidates who agreed to participate in the study were asked to sign a consent form. From the total of 529 respondents who attempted the survey, 188 participants were included in the study, as they fulfilled the inclusion criteria. The remaining 341 participants had never smoked a water pipe, so they did not fulfill the inclusion criteria, and were therefore excluded.

### 2.2. Statistical Analysis

For the statistical analysis, data were extracted from the online system and analyzed using Statistical Package for the Social Sciences (SPSS) version 21 (Armonk, NY: IBM Corp.). To evaluate the statistical significance of differences among proportions of categorical data, Chi-squared analyses were used. The non-parametric Fisher’s exact test (two-tailed) replaced the Chi-square test in cases of small sample size, where the expected frequency was less than 5 in any of the cells in  $2 \times 2$  tables.

### *Ethics approval*

The study was approved by the Medical Research Ethics Committee at the College of Medicine and Health Sciences of Sultan Qaboos University.

## 3. Results

### *Characteristics of water pipe smokers*

Table 1 shows the socio-demographic characteristics of the participants by age group, stratified at the mean age of 23 (standard deviation [SD] 2.6) into the younger group (23 years old or less) and the older group (older than 23 years). Of the total 188 participants, there were 96 (51.1%) younger

participants and 92 (48.9%) older participants. Females constituted only 7.4% of the sample. The majority of the participants were Omani nationals (93.6%), unmarried (73.9%), unemployed (54.3%), and enrolled in the institution at bachelor's degree level (81.4%).

**Table 1.** Socio-demographic Data.

Characteristics	Total (N = 188) N (%)	Younger ( $\leq 23$ y) (N = 96) N (%)	Older ( $> 23$ y) (N = 92) N (%)	P value
Age				
23 years old or less	96 (51.1)	96 (100)	0	
More than 23 years old	92 (48.9)	0	92 (100)	
Gender				0.3
Female	14 (7.4)	9 (9.4)	5 (5.4)	
Male	174 (92.6)	87 (90.6)	87 (94.6)	
Citizen of Oman				0.08
Omani	176 (93.6)	87 (90.6)	89 (96.7)	
Non-Omani	12 (6.4)	9 (9.4)	3 (3.3)	
Marital Status				0.0000
Single	139 (73.9)	84 (87.5)	55 (59.8)	
Married	44 (23.4)	7 (7.3)	37 (40.2)	
Others	5 (2.7)	5 (5.2)	0 (0.0)	
Employment Status				0.0004
Unemployed	102 (54.3)	64 (66.7)	38 (41.3)	
Employed	86 (45.7)	32 (33.3)	54 (58.7)	
Education level				0.013
Diploma	15 (7.9)	13 (13.5)	2 (2.2)	0.3
Bachelor's degree	153 (81.4)	72 (75.0)	81 (88.0)	
Masters	20 (10.7)	11 (11.5)	9 (9.8)	

#### Water pipe use history

Table 2 describes the history of WTS among the participants. The majority of participants began WTS at the age of 18 (SD 3.8), with their friends (86.7%). The remaining participants were either alone or with family members. The vast majority (85.6%) had initiated WTS in a café, while 11.2% started smoking at home and only 3.2% at a university accommodation. More than half had smoked a water pipe within the last 30 days. Among those who had smoked within the last 30 days, the most reported WTS frequency was smoking at least once in the last 1-5 days (64.9%), followed by at least one head of water pipe within

the last 6-9 days (26.6%), and the previous 10 days or more (8.5%). Among those who had smoked within the last 30 days, the majority reported smoking 2-9 heads of water pipe over that time period. The majority (92.6%) last smoked in a café, and one third of them smoked for less than 30 minutes.

Among those who had smoked within the last 30 days, WTS was significantly higher among the older group age (67.4% as compared to 46.9%;  $P = 0.038$ ). In comparison to the older group, the younger group had a significantly higher proportion of people who had smoked within the last 10 days or longer (13.5% versus 3.2%;  $P = 0.002$ ).

**Table 2.** Waterpipe use history.

Characteristics	Total (N = 188) N (%)	Younger ( $\leq 23$ y) (N = 96) N (%)	Older ( $> 23$ y) (N = 92) N (%)	P value
Age of WTS initiation				0.018
$\leq 18$ years	86 (45.7)	52 (54.2)	34 (37.0)	
$> 18$ years	102 (54.3)	44 (45.8)	58 (63.0)	
Who was there during WTS initiation				
Alone	14 (7.4)	8 (8.3)	6 (6.5)	0.64
Friends	163 (86.7)	81 (84.4)	82 (89.1)	0.34
Family	11 (5.9)	7 (7.3)	4 (4.3)	0.39
Where was WTS initiation				
Smoke shop	161 (85.6)	84 (87.5)	77 (83.7)	0.46
At home	21 (11.2)	10 (10.4)	11 (12.0)	0.74
University accommodation	6 (3.2)	2 (2.1)	4 (4.3)	0.4
Smoked water pipe in last 30 days				0.038
Yes	102 (54.3)	45 (46.9)	57 (62.0)	
No	86 (45.7)	51 (53.1)	35 (38.0)	
Frequency of WTS in last 30 days				
1-5 days	122 (64.9)	66 (68.8)	56 (60.9)	0.50
6-9 days	50 (26.6)	17 (17.7)	33 (35.9)	0.005

Characteristics	Total (N = 188)	Younger ( $\leq 23$ y) (N = 96)	Older ( $> 23$ y) (N = 92)	P value
	N (%)	N (%)	N (%)	
$\geq 10$ days	16 (8.5)	13 (13.5)	3 (3.3)	0.002
Waterpipe heads in past 30 days				
< 2	7 (3.7)	4 (4.2)	3 (3.3)	1.0
2-9	161 (85.6)	79 (82.3)	82 (89.1)	0.18
> 9	20 (10.7)	13 (13.5)	7 (7.6)	0.19

WTS = Water pipe smoking.

#### *Current water pipe smoking*

Table 3 describes current WTS smoking habits. A higher proportion of waterpipe products were purchased from caf  s (64.4%), followed by supermarkets, friends, and from the internet. The most popular flavor was “double apple” (59.0%), followed by “grape” and “mint”. Although some participants reported using different brands of WTS products, 40.4% were loyal to a specific brand. In comparison to the younger group, a significantly higher proportion of the older

group reported purchasing waterpipe products from caf  s (75.0% compared to 54.2%;  $P = 0.003$ ). “Double apple” was the most common flavor of choice among both age groups. In the younger group, 21.9% reported smoking different flavors from among the less popular flavors, compared to only 3.3% of the older group ( $P = 0.0001$ ). The older group was more likely to report loyalty to a specific brand of water pipe tobacco compared to the younger age group (51.1% versus 30.2%;  $P = 0.004$ ).

**Table 3.** characteristics of the current use of WTS products.

Characteristics	Total (N = 188)	Younger ( $\leq 23$ y) (N = 96)	Older ( $> 23$ y) (N = 92)	P value
	N (%)	N (%)	N (%)	
Where are water pipe products purchased from?				
supermarket	35 (18.6)	20 (20.8)	15 (16.3)	0.43
Cafe	121 (64.4)	52 (54.2)	69 (75.0)	0.003
Friends	8 (4.3)	4 (4.2)	4 (4.3)	1.0
Internet	2 (1.1)	2 (2.1)	0 (0)	0.5
Never	22 (11.7)	18 (18.7)	4 (4.3)	0.002
What flavor do you usually smoke?				
Apple/Double Apple	111 (59.0)	51 (53.1)	60 (65.2)	0.092
Grape	31 (16.5)	13 (13.5)	18 (19.6)	0.27
Mint	23 (12.2)	11 (11.5)	12 (13.0)	0.74
Others	24 (12.8)	21 (21.9)	3 (3.3)	0.0001
When was the last time you smoked a water pipe?				
$\leq$ week	110 (59)	49 (51.0)	61 (66.3)	0.034
> Week- $\leq$ month	39 (21)	21 (21.9)	18 (19.6)	0.7
> month	39 (20)	26 (27.1)	13 (14.1)	0.029
What flavour did you smoke last time?				
Apple/Double Apple	111 (58.5)	53 (55.2)	58 (63.0)	0.28
Grape	16 (8.5)	5 (5.2)	11 (12.0)	0.1
Mint	18 (9.6)	5 (5.2)	13 (14.1)	0.038
Others	43 (22.9)	33 (34.4)	10 (10.9)	0.0001
What brand did you smoke last time?				
Amir	9 (4.8)	4 (4.2)	5 (5.4)	0.7
Fakher	76 (40.4)	29 (30.2)	47 (51.1)	0.004
Nakhla	33 (17.5)	15 (15.6)	18 (19.6)	0.48
Others	70 (37.2)	48 (50.0)	22 (23.9)	0.0002
Where did you last smoke a waterpipe?				
Smoke shop	174 (92.6)	88 (91.6)	86 (93.5)	0.64
At home	10 (5.3)	4 (4.2)	6 (6.5)	0.47
University accommodation	4 (2.1)	4 (4.2)	0 (0.0)	0.1
How long was your last WTS session?				
< 30 minute	58 (30.9)	30 (31.3)	28 (30.4)	0.9
30-60 minute	71 (37.8)	38 (39.6)	33 (35.9)	0.6
> 60 minute	59 (31.9)	28 (29.2)	31 (33.7)	0.5

WTS = water pipe smoking.

#### *Attitudes and intentions regarding water pipe smoking*

Table 4 describes the attitudes, beliefs, and the intentions towards WTS. The majority of water pipe smokers reported their intention to quit smoking in future (69.1%) and they

were confident that they would be able to quit WTS.

The older group reported a higher level of intending to quit WTS compared to the younger group (75.0% vs. 63.5%;  $P = 0.09$ ). Conversely, the younger group were more confident

towards their ability to quit or reduce WTS within next five years (33.3% as compared to 15.2;  $P = 0.004$ ). The majority

of participants (47.3%) think it is less addictive and less harmful when compared with cigarettes.

**Table 4.** Attitudes and intentions regarding waterpipe tobacco smoking.

Characteristics	Total (N = 188)	Younger ( $\leq 23$ y) (N = 96)	Older ( $> 23$ y) (N = 92)	P value
	N (%)	N (%)	N (%)	
Health warnings labels				0.2
seen	75 (39.9)	34 (35.4)	41 (44.6)	
not seen	113 (60.1)	62 (64.6)	51 (55.4)	
Intend to quit WTS at any time				
Not at all	35 (18.6)	21 (21.9)	14 (15.2)	0.24
Future	130 (69.1)	61 (63.5)	69 (75.0)	0.09
Already quit	23 (12.2)	14 (14.6)	9 (9.8)	0.32
Confident of quitting WTS				
not at all	19 (10.1)	34 (35.4)	12 (13.0)	0.19
confident	106 (56.4)	62 (64.6)	48 (52.2)	0.26
very confident	63 (33.5)	31 (32.3)	32 (34.8)	0.72
In 5 years, do you think your WTS habits will be				
More	38 (20.2)	20 (20.8)	18 (19.6)	0.83
Same	52 (27.7)	22 (22.9)	30 (32.6)	0.14
Less	46 (24.5)	32 (33.3)	14 (15.2)	0.004
Quitted	52 (27.7)	22 (22.9)	30 (32.6)	0.14
Beliefs of WTS compared to cigarette smoking				
A-Harmful				
Less	66 (35.1)	35 (36.5)	31 (33.7)	0.69
Same	49 (26.1)	18 (18.8)	32 (34.8)	0.013
More	72 (38.1)	43 (44.8)	29 (32.6)	0.061
B-addictive				
Less	89 (47.3)	48 (50.0)	41 (44.6)	0.46
Same	46 (24.5)	17 (17.7)	29 (31.5)	0.028
More	53 (28.2)	31 (32.2)	22 (23.9)	0.202
B-nicotine concentration				
Less	70 (37.2)	35 (36.5)	35 (38.0)	0.822
Same	48 (25.5)	24 (25.0)	24 (26.0)	0.864
More	70 (37.2)	37 (38.5)	33 (36.0)	0.705

WTS = water pipe smoking.

## 4. Discussion

There is currently a dearth of epidemiological data describing WTS, a major public health problem in Oman. To the best of our knowledge, this study is the first to describe the behaviors, attitudes, beliefs and intentions towards WTS among university student users in Oman. This findings from this study support previous studies, which have shown that most waterpipe smokers are male [10].

With regards to participant history and current WTS status, this study found that the mean age of initiating WTS was 18.3 years old ( $\pm 3.8$ ), whereas the mean age of the participants was 23 years. Maziak et al. and Taha et al. both reported a mean ( $\pm$  SD) age of WTS initiation similar to the current study [1]. Most of participants in this study reported smoking in cafés or restaurants with their friends. Few of them smoked at home and even fewer in university accommodations. Peer pressure appeared to play a major role in the findings of this study. Notably, current WTS regulations regarding smoking in public areas are not stringent, and these should be taken into consideration when planning future interventional strategies.

High frequency of daily smoking was noted in both age group categories, perhaps reflecting a dependence on nicotine. Interestingly, compared to the older age group the number of participants who smoked every 10 days was higher among the younger age group [11]. This can be explained by a nicotine dependence which progresses with age.

To the best of our knowledge, no prior studies have reported on the number of waterpipe heads smoked per day, including information on preferred flavor and brand. In the current study, we found that both age groups smoked a similar number and for a similar duration per day [12]. This could be due to the influence of friends with whom the smoker spends time with. Both age groups have similar preferred flavor of waterpipe tobacco (massaal) and brand, however, it was noted that the younger age group had a tendency to use different flavors and brands when compared with the older age group. May be, The curiosity to try different flavors and brands they develop persuasion regarding them [13].

Overall, the participants in this study believed that WTS and cigarette smoking had similar nicotine concentrations and were equally harmful, compared with a study by Amin TT et al., where the majority of participants believe that

waterpipes were more harmful in comparison to cigarettes [14]. Akl *et al.* and Amin *et al.* found that the participants in their studies thought that waterpipe smoking was less addictive than cigarette smoking, which mirrored findings from the current study [15].

Around 69.1% of waterpipe smokers are willing to quit smoking. Many studies conducted in Middle Eastern countries have reported variable percentages of waterpipe smokers interested in quitting (64% in Lebanon, 62% in Egypt, 50% in Iraq, 49% in Syria and 21% in Turkey).

We noted that a high proportion of the participants in this study had an interest in quitting WTS, as they know it is as harmful as cigarettes.

## 5. Conclusion

This study found that flavors, brands, prices and availability of WTS in caf  s all appear to play a role in attracting young students to WTS. This study concludes that young generation needs more awareness regarding hazards of WTS. Further studies are needed to understand the contributing factors and behaviors of waterpipe smokers, which will lead to prevention as well as updated regulation policies to address this emerging healthcare problem in Oman.

## Limitation of the Study

Students were sometimes hesitant to participate in the study, although it was explained to them that their information would be kept confidential and no names or identification would be noted down. The questionnaires were relatively long, which made some students unhappy to participate in this study.

## Conflict of Interest

The authors declare that they have no competing interests.

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