

**PREVALENCE OF WATER-PIPE SMOKING AND ITS ASSOCIATED FACTORS AMONG ARAB STUDENTS IN
MALAYSIA**

Running title: Water-pipe smoking in Malaysia

Abstract

Background

The prevalence of water-pipe smoking has been rapidly increasing among youths throughout the world. According to WHO, more than 100 million people use water-pipe regularly. In Malaysia, the prevalence of water-pipe smoking among students has previously been found to be 20%.

Objective

The purpose of this Study is to estimate the prevalence of water-pipe smoking among Arab-students in Kuala Lumpur (KL) and Selangor, Malaysia, and to assess their knowledge on the health-outcomes of water-pipe smoking.

Method

This Study was conducted among Arab-students at convenient places in KL and Selangor from March to July 2017. The students were above 18 and studying in universities. A community-based cross-sectional study was conducted. The data was collected at universities using a pre-tested, self-administered Questionnaire. 243 students participated in this Study selected using a non-probability snowball sampling method. The final data was analyzed using SPSS software (version 19).

Results

22 The Study showed high prevalence of Water-pipe smoking of 33.7%. Male students had a higher
23 prevalence than female (37.1%; 29% respectively). Age was found to be significantly associated ($p =$
24 0.01). Those with poor knowledge about water-pipe smoking were found to be 38.3%. Slightly more
25 than half of the water-pipe smokers (51.2%) had started smoking before the age of 18.

26 Conclusion

27 This Study proves that water-pipe smoking among Arab-students remains a significant public health
28 concern. Thus, there is an urgent need for the Malaysian authorities to implement new regulations on
29 water-pipe smoking. Further studies should be done among different migrant-populations and locals in
30 Malaysia.

31 **Key-words:** water-pipe smoking; cigarette-smoking; prevalence; knowledge of health-outcomes; Arab-
32 students; cross-sectional-study; self-administered questionnaire; socio-demographic factors; age start
33 smoking; Rules and Regulations; migrant-populations; nicotine; carbon monoxide; toxicants

Comment [DB1]: Key word should not be more than five

Attended to and highlighted

35 Introduction

36 1. Previous Studies

37 According to the National Health and Morbidity Survey of Malaysia, diseases related to smoking such as
38 cancer and cardiovascular diseases are known to be the main causes of premature-death in Malaysia -
39 smoking kills about 20,000 Malaysians every year and it is expected to raise to 30,000 by the year 2020.

40 1

41 According to WHO, water-pipe causes a serious health-effect, and it has a number of toxicants known to
42 cause cancer, heart diseases and other diseases. 1

43 Although the water absorbs the nicotine in hookahs, smokers are still exposed to a sufficient dose of
44 nicotine that causes addiction.

45 Reducing the amount of nicotine is good for health, but the reduced amount leads to inhalation of
46 higher amounts of smoke that can cause cancer and other respiratory diseases. 1

47 Sharing of water-pipe mouthpieces contribute to a serious risk of communicable-disease transmission
48 among smokers. 1

49 To attract youths by providing a better taste, water-pipe tobacco is usually flavoured and sweetened
50 which probably explains why some youths do not use other forms of nicotine, being used to hookah. 1

Comment [DB2]: Are there different kinds of water-pipe smoking?
If there are the authors should write a small paragraph on water pipe smoking and the various types.

Attended to and highlighted

Comment [DB3]: No reference

Reference added and highlighted

51 1.1 Effects of socio-demographic characteristics

52 Socio-demographic characteristics like gender seem to have effects on water pipe smoking. In general,
53 there is higher prevalence among males than females. A research conducted among 2,328 students in
54 the U.S. estimates higher prevalence among males than females (11.9%, 8.2% respectively). 2 Another
55 research determined higher prevalence among male (3.6%), while 1.8% among compared to females
56 female (1.8%). 3

Comment [DB4]: The authors used only one reference for the whole of this section?

More references added, discussed and highlighted

57 One more study saw greater prevalence among males 7.3%, than females at 5.5%. 4 Gender was
58 significantly associated with water pipe smoking in Saudi Arabia with greater prevalence among males
59 than females (22.3%, 10.2% respectively). 5

60 Young age was significantly associated with water-pipe smoking, 63.8% of medical students in Saudi
61 Arabia started shisha-smoking at age 16 to 18 years. 6 Another research found 32.2% of water-pipe
62 smokers are above 18 years old. 2

63 1.2 Prevalence of water pipe smoking in Arabian countries

64 Water-pipe smoking prevalence is high in Arabian countries as it is a part of their culture. A study
65 conducted in Saudi Arabia found the overall prevalence of shisha-smoking to be 12.6%. 6 Another study
66 in Saudi Arabia determined the prevalence of water-pipe smoking as 16.9%. 5

67

68 **1.3 Prevalence of water-pipe smoking in Malaysia**

69 A study was conducted among 300 students in Kuala Lumpur, and the prevalence was found to be 20%.
70 7 Malays had a high prevalence at 47% in Petaling Jaya, Selangor. 8

71 **1.4 Prevalence of water pipe smoking in different countries**

72 The prevalence of water-pipe use among all New Jersey youth was 9.7%. 9 But, other researchers in
73 Canada found the prevalence at 2.7%. 3 A study carried out in US among college-students indicated
74 9.9% prevalence. 2

75 Another study in America found that the prevalence of water-pipe smoking among middle-school
76 students was 2.1%, and higher among high-school students at 5.4%. 4 The prevalence was high among
77 American first-year students at 20%.10 But in Turkey, the prevalence of current users is 32.7% in Erciys
78 University. 11

79 **1.5 Prevalence of water-pipe smoking among migrants**

80 A study showed the prevalence of water pipe smoking among Arab-American was 3.6%, which is less
81 compared to non-middle eastern White adults at 1%. A study in the U.S. reported the prevalence among
82 Arabs was less than 30%. The prevalence among Arab Yemeni in the U.S. is 17.1%

83 **1.6 Knowledge on health outcomes of water-pipe smoking**

84 A number of people in one study in Malaysia claimed that water-pipe smoking is not harmful to health
85 and does not harm passive-smokers. A number of them felt that shisha does not contain nicotine,
86 although the vast majority of them concurred that disease-contamination can be spread by sharing the
87 shisha-pipe. 8

88 Other researchers claimed that most of the participants were aware of it being a hazard-factor for oral
89 cancer, periodontal sicknesses beside tooth and oral tissue recoloring. 5 Another research estimated
90 higher mean score of knowledge, attitude, and hazard perception for non-smokers than smokers. 12
91 Meanwhile, 90.5% of participants in another research considered water-pipe smoking to be harmful to
92 health. 13 Yet in another, 91.5% of participants claimed shisha was a risk for health. 14

93 1.7 Knowledge about water-pipe smoking compared to cigarette-smoking

94 In general, people consider water-pipe smoking as less harmful than cigarette. In one research in
95 Malaysia, the vast majority of participants claimed that water-pipe is not as harmful as cigarette-
96 smoking. 8 Yet in another research conducted in San Diego and California, a large number of water-pipe
97 users (58.3%) believed that water-pipe smoking is less harmful than cigarette smoking. 15 Participants in
98 a study conducted in the U.S. also thought water-pipe was less harmful. 10

99 Researchers say that half of participants thought water-pipe was less harmful than cigarette. 12
100 Furthermore, in the U.S. about 33.1% of the participants in a research trusted that water-pipe smoking
101 was less harmful than cigarette smoking, while over half (52.1%) felt that water-pipe smoking was less
102 addictive than cigarette smoking. And, about 36.4% considered water-pipe smoking as more socially
103 accepted. 4

104

105 1.8 The main attractions of water pipe smoking

Comment [DB5]: "Knowledge about harmful effects water-pipe smoking compared to cigarette-smoking" might be a better heading

Subtitles under the Introduction have been removed for total prose as recommended by one more Reviewer.

106 In one research conducted in Turkey, 9.1% of the participants said they smoke for relaxation, and 7.3%
107 because they enjoyed the taste. 16

108 **1.9 The question of banning water-pipe smoking among minors and at public places**

109 In a research conducted in Lebanon among pregnant women, the majority of the participants (75.6%)
110 supported banning water-pipe smoking on minors (<18 years old). 17

111 **1.10 Experimental studies on the risk factors of water-pipe smoking**

112 A study was conducted to assess the carcinogenic-PAH (polycyclic aromatic hydrocarbons) content of
113 three charcoal products commonly used in Lebanon for water-pipe smoking. It was found that the
114 charcoal contained a large number of PAH, including benzo (a) pyrene (grouped as a carcinogen). 18

115 One other study compared water-pipe smoking to cigarette smoking. It was found that water-pipe
116 smoking had higher exposure to benzene, and greater amount of PAH. 19 Another study showed an
117 increase in carbon-monoxide by 23.9ppm for water-pipe use compared to 2.7ppm for cigarette smoking.
118 There was no difference in the nicotine level, but total puff value was 48.6L for water-pipe smoking
119 compared to 1L for cigarette. 20

120 A study showed that the average of ultrafine side-stream particle emissions for four repeated water-
121 pipe smoking sessions was 3.99, while for four repeated cigarette-trials it was only 0.638. For expired air
122 CO, for cigarette, mean ($\pm$ SEM) pre-smoking CO level was 5.1 ± 0.5 ppm and increased to 7.8 ± 0.6 after
123 smoking, while for water-pipe, mean pre-smoking CO level was 4.7 ± 0.5 ppm and increased to 28.7 ± 3.5
124 after smoking. The higher post-smoking CO associated with water-pipe tobacco smoking was significant
125 ($P < 0.001$). 21

126 **Method**

127 A community-based, cross-sectional survey was conducted among medical Arab students in Kuala
128 Lumpur and Selangor, states of Malaysia. A quantitative approach was used to determine the
129 prevalence of water pipe smoking as well as assess the knowledge on health outcomes, assess the
130 association between independent variables (socio-demographic characteristics) and dependent
131 variables (prevalence of water pipe smoking and knowledge about water-pipe smoking)

132 The Study took place from March to June 2017 using a convenience-sample of 243 students, all 18 years
133 of age and older. The data was collected via an anonymous, pre-tested, self-administered
134 Questionnaire. The Questionnaires were distributed in three universities: GEOMATIKA university in KL,
135 besides SEGI and MAHSA universities in Selangor during the weekdays, and in restaurants and cafes
136 during weekends. Total confidentiality was ensured.

137 A non-probability sampling method was used - this type being snowball-sampling in which existing
138 subjects select further subjects from among their associates. With this kind of sampling method, it was
139 possible to collect the data from sufficient number of male and female students to conduct a
140 comparative study.

141 The sample size was calculated separately for each variable, and then the most appropriate sample size
142 was obtained as the target sample size of the research.

143 Previous studies done elsewhere in which prevalence, socio-demographic factors and prevalence of
144 cigarette-smoking among water-pipe users was used to determine the sample-size calculated based on
145 two-tailed α with the p-value being equal to 0.05 at a 95% confidence interval (CI), $Z \alpha$ was equal to 1.96
146 at 80% power, $\beta = 0.2$ and $Z \beta = 0.84$.

147 Three questions in the Questionnaire were used to determine knowledge concerning the harmful nature
148 of water-pipe smoking and its health outcomes.

149 Attitude and practice toward water-pipe smoking was determined by examining the frequency of
150 smoking, age started smoking, place of smoking, influence of others, main attraction, and smoking
151 circumstances.

152 Participants' opinion on whether they agree on banning water-pipe smoking by minors was ascertained,
153 besides whether there should be banning at restaurants and bars.

154 The participants had a choice of a Questionnaire in the Arabic-language, or in the English-language.

155 Socio-demographic factors of relevance were course-of-study, educational-level, gender, age, nationality
156 and marital status.

157 The final-version of the Questionnaire was translated into Arabic language which is the mother-tongue
158 of the participants. Then, the questionnaire was revised by a specialist in the Arabic language to ensure
159 all questions remain unchanged after translation. The questionnaire was pre-tested on a group of Arab-
160 students.

161 The pre-testing was conducted among 30 participants that have the same inclusion-criteria as the study-
162 population. Subsequently, these respondents were excluded from the study-population.

163 A written informed-consent to participate in the study was obtained from each participant.

164 The Study was approved by the Ethics Committee of the Faculty of Medicine, MAHSA University,
165 Malaysia.

166 Data-cleaning for identifying and removing errors from the data to enhance the quality of data was
167 done. In this study, errors appeared as missing-information or invalid-data. Double-scan was done by
168 the researcher himself to verify for completeness, and then data-cleaning was conducted for all missing
169 data. Unfinished questionnaires were excluded from the ~~dated~~data-entry. After that, the data was
170 entered into a database by utilizing Statistical Package for the Social Sciences (SPSS) software Version

19, and data-cleaning was actualized to correct possible errors and missing-data prior to statistical analysis of valid-data.

Hypothesis testing for all variables was conducted by using chi-square test to determine the presence of an association between each variable within socio-demographic characteristics and the prevalence of water-pipe smoking and the knowledge separately. Then, simple logistic regression test was used to determine significant association, as well as measuring Odds ratio and 95%CI.

Chi-square test and simple logistic regression tests were used to determine the association between the socio-demographic characteristics and the prevalence of water-pipe smoking. Multiple logistic regression test was used to identify the factors that influence the prevalence of water-pipe smoking.

Chi-square test and simple logistic regression tests were used to determine the association between the socio-demographic characteristics and the knowledge on water-pipe smoking health outcomes. Multiple logistic regression test was used to identify the factors that influence the knowledge on water-pipe smoking health outcomes.

184 **Results**

185 Table 1 summarizes the relevant prevalences.

186 **Table 1: Prevalence of water-pipe (WP) smoking**

	Prevalence of water-pipe smoking	95% CI Lower limit - Upper limit
Currently using WP	33.7%	28.01 - 39.87%
Ex-users of WP	18.2%	13.2 - 22.9%
Ever used WP	51.9%	45.57 - 58.09%
Non-users	48.1%	41.9 - 54.4%

189 Table 2 summarizes the socio-demographic characteristics of the participants.

190 **Table 2: Socio-demographic characteristics of the participants**

SD Characteristics	Frequency	Percentage
Course of study:		
Medical	77	31.7%
Non-medical	166	68.35%
Educational level:		
Degree	167	68.7%
Postgraduate	76	31.3%
Gender:		
Male	143	58.8%
Female	100	41.2%
Age group:		
18-22	116	47.7%
23-26	62	25.5%
27-30	29	11.9%
31-40	26	10.7%
>40	10	4.1%
Nationalities:		
Libyan	75	30.9%
Yemeni	86	35.4%
Other Arabian nationalities	82	33.7%
Marital status:		
Single	183	75.3%
Married	56	23%
Divorced	4	1.6%

191
192
193 Nationality was significantly associated with the prevalence of WP smoking ($P = 0.037$, $OR=2.07$), there
194 was a significant difference between Yemeni and Libyan students - Yemeni have the highest prevalence
195 of current and ever-use of water-pipe smoking (39.5%;57% respectively), and then Libyan students have

196 the lowest prevalence among Arab students, 24% for current-use and 48% for ever-used. As was
197 expected, male students have higher prevalence of current-use and ever-use of water-pipe smoking -
198 62.2% of male students have tried WP and 37.1% were current-users, while 37% of female students
199 have tried WP and 29% were current-users.

200 The highest prevalence of water-pipe smoking was found in the age-group 18-22, whereas more than
201 half (55.2%) have ever-used water-pipe and 39.7% were current-users. Nearly half (51.6) of the students
202 aged 23 to 26 have tried WP and 32.3% were current-users. Age-group of 27-30 also have high
203 prevalence of WP smoking (37.9%), meanwhile age groups of 31-40 and >40 were found to have slightly
204 lower prevalence i.e. 11.5%; 20% respectively.

205 The total number of current and ever-use of water-pipe smoking was found to be higher among
206 undergraduate-students i.e. 37.1%; 54.5% respectively, while 26.3% of postgraduate-students were
207 current-users and 46.2% were ever-used.

208 Medical students have higher prevalence of current use than non-medical students (35.1% cf. 33.1%).
209 But, 53.6% of the non-medical students had ever-used WP, while less than half (48.1%) of medical-
210 students have ever used it. From the results of the simple logistic regression, independent variables that
211 have a p-value <0.25 were included in the multi-logistic regression.

212 Table 3 summarizes the Association between socio-demographic characteristics and prevalence of water
213 pipe smoking.

214

215 **Table 3: Association between socio-demographic characteristics and prevalence of water pipe**
216 **smoking.**

Variables	Current use (%) n	p value	Simple logistic regression OR(95%CI)
Nationalities			
Libyan	(24) 18		Ref.
Yemeni	(39.5) 34	<u>0.037</u>	2.071(1.045-4.103)
Gender			
Male	(27.1) 52		Ref.
Female	(29) 29	0.19	1.442(0.832-2.496)
Age group			
18-22	(39.7) 46		Ref.
23-26	(32.3) 20	0.235	0.38(0.77-1.872)
27-30	(37.9) 11	0.441	0.525(0.102-2.702)
31-40	(11.5) 3	0.309	0.409(0.73-2.288)
>40	(20) 2	0.516	1.917(0.27-3.631)
Educational level			
Postgraduate	(26.3) 20		Ref.
Degree	(37.1) 62	0.1	1.653(0.908-3.011)
Course			
Medical	(35.1) 27		Ref.
Non-medical	(33.1) 55	0.7	1.090(0.617-1.925)
Marital status			
Married	(25) 14		Ref.
Single	(36.1) 66	0.127	10692(0.861-3.327)

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223 Table 4 summarizes the factors which could influence water-pipe smoking.

224 **Table 4: Multi-logistic regression analysis showing the factors that can influence WP smoking.**

Variables	Crude OR (95%CI)	Adjusted OR (95%CI)	p value
Nationality			
Libyan	Ref.	Ref.	0.037
Yemeni	2.071(1.045-4.103)	1.942(0.912-4.135)	
Gender			
Female	Ref.	Ref.	0.19
Male	1.442(0.832-2.496)	1.51(0.866-2.66)	
Educational level			
Postgraduate	Ref.	Ref.	0.1
Degree	1.653(0.908-3.011)	1.283(0.563-2.721)	
Marital status			
Married	Ref.	Ref.	0.127
Single	1.692(0.861-3.327)	1.428(0.592-3.447)	

225

226 As is seen, Yemeni students have increased odds of being WP smokers by 2.071 times than Libyan

227 students.

228 Male students have increase odds of being WP smokers by 1.442 times than female students.

229 Degree students have increase odds of being WP smokers by 1.653 times than postgraduate students.

230 Students who are single have increase odds of being WP smokers by 1.692 times than students who are

231 married.

232 The vast majority of the participants stated they were influenced by their friends to smoke WP i.e. a

233 total of 111 (88.8%). Only 4.8% and 6.4% said they were influenced by their family or relatives

234 respectively.

235 Restaurants and cafes were the favourite smoking-area of 76% of the smokers and only 24% mentioned
236 they smoke at home. 20% of the smokers were heavy smokers as they smoked daily and 38.4%
237 mentioned they smoke weekly and 31.6% mentioned they smoke once in a while.

238 It was found also that slightly more than half of the smokers (51.2%) had started smoking before the age
239 of 18. 11.2% had started between the age of 12 to 15 and 40% had started between the age of 16 to 18.
240 Prevalence of cigarette-smoking among participants was 24.3% (35.7% male; 8% female).

241 In this study, a high percentage of respondents (60%) said the flavoured taste was the main attraction
242 for them and 18.4% said the nice smell attracted them to use WP - while 11.2% of respondents said they
243 smoked WP because they have heard it is helpful to reduce weight. For the smoking-circumstances,
244 32.8% of participants said they smoke when they are relaxed, 27% during social-gatherings and 24% said
245 they smoked after eating. 35.7% of water-pipe users were current cigarette smokers as well.

246 Concerning knowledge of participants about water pipe smoking, 14.4% of respondents answered that
247 “water-pipe smoking has no harm to health at all”, and 18.9% indicated that “WP smoking was less
248 harmful than cigarettes”. About 19.8% of respondents had no idea if WP smoking causes lung diseases,
249 and 4.9% said WP was safe to the lungs.

250 Most of the participants (75.3%) recognized that WP smoking may lead to heart disease, but only 44% of
251 respondents said WP could be a source of infection. 57.6% of respondents answered that WP smoking
252 may cause gum and mouth diseases.

253 In this study, 25.1% of respondents answered that WP had less nicotine than cigarette and 24.7% said it
254 had less tar. Regarding addiction, 33.3% of respondents indicated that WP was less addictive.

255 Concerning association between socio-demographic characteristics and knowledge, In this Study, people
256 with poor knowledge concerning water-pipe smoking were found to be 38.3% of the study-sample. Chi-

Comment [DB6]: poor knowledge of harmful effects?

“Poor knowledge and good knowledge” are now better defined unambiguously.

square test was conducted to assess the associations between the socio-demographic characteristics as independent variables and knowledge as a dependent variable, all in a categorical format. Then, simple logistic regression was conducted on the variable that had a significant association with the knowledge.

Gender was found to be significantly associated with good knowledge on WP smoking ($p < 0.05$ and $OR 0.162$; 95%CI: 1.274-3.669), since it was found that male students have better knowledge than female students.

Educational-level was found to be associated with knowledge - students with higher level of education had higher scores. Other socio-demographic characteristics such as age, course of study (medical or non-medical), nationality and marital state was not associated.

From the results of the simple logistic regression, independent variables that have had the p -value < 0.25 were included in the multi-logistic regression. In this Study, gender was significantly associated.

Male students have increased odds of having good knowledge on WP smoking by 2.164 times than female students.

Students who have a higher level of education (postgraduate) have increased odds of having good knowledge by 1.663 times than degree students.

Students who are not current users of WP have increased odds of having good knowledge by 1.664 times than current-users.

Tables 5 and 6 summarize the participants stand on banning WP by minors and in restaurants/bars.

Table 5. Ban minors smoking water pipe

	Frequency	Percentage
Strongly oppose	13	5.3%
Somewhat oppose	24	9.9%

Somewhat support	38	15.6%
Strongly support	168	69.1%

Table 6: Ban smoking water pipe in restaurants and bars

	Frequency	Percentage
Strongly oppose	44	18.1%
Somewhat oppose	72	29.6%
Somewhat support	49	20.2%
Strongly support	78	32.1%

Discussions

1. Prevalence of water pipe smoking

In this Study, the prevalence of water-pipe smoking among Arab students in KL and Selangor was 33.7%, while the prevalence among Malaysian students in 2012 was found to be 20%. One other research conducted in Malaysia also showed the prevalence in Shah Alam, was much less at 5.9%. 22 Why do Arabs have a higher prevalence? 7 First of all, water-pipe smoking is a part of the Arabian culture.

The second possibility is that, most of Arab-students study in Malaysia without the supervision of their families thus making it more difficult to control their habits and their life-styles.

The third reason could be the higher amount of money that Arab-students receive from their parents each month for their living-expenses, compared to Malaysian students.

The prevalence of this Study is close to that in a study conducted among students in Lebanon, where the current prevalence of water pipe smoking was 29.6% among 28,378 students. 23

Comment [DB7]: What is KL

Has been re-written as Kuala Lumpur. Apologies.

Comment [DB8]: Any reference for this?

There aren't any references for this – not more than hearsay from talk among the Arab-students here. Which is why the authors use the phrase “could be”.

2. Association between socio-demographic characteristics and prevalence of WP smoking

Yemeni students have the highest prevalence of water-pipe smoking among the study-population at 39.5%; Libyan at 24% and other Arabian nationalities at 36.5%.

Male students as it was expected have a higher prevalence of water-pipe smoking at 37.1%, while females only 29%. A study by Jordan and Delnevo (2010) also showed male preponderance. 9

On the other hand, one other study conducted in the U.S. reported higher ever-use among females than males (64.8%, 35.2% respectively). 24

In this Study, 51.2% of water-pipe users started smoking before 18 years of age, while in a previous study in Malaysia 47.3% of water-pipe smokers start smoking before 18 years of age. 25

3. Attitude towards water pipe smoking and its main attractions

A vast majority of the WP-user respondents (88.8%) indicated they were influenced by their friends to smoke water pipe. 76% of the users said that restaurants were their favourite smoking area, while only 24% said they smoke at home.

Frequency of smoking was indicated as a daily and weekly habit in 20% and 38.4% respectively.

Finding out the main attractions of water-pipe smoking is a fundamental step in preventing and reducing smoking. In this Study, the majority of the users (60%) said they had chosen water-pipe smoking because of its flavored-taste, which matched the finding of one other research conducted among Malaysian students. 26

Concerning the circumstances of smoking WP, while 32.8% of the users said they smoke when they were relaxed, in one other research only 7.3% of the smokers were smoking water pipe to feel relaxed. 16

Comment [DB9]: What reasons can you proffer for this?

No reasons, because such difference between the sexes is not consistently seen between regions.

Comment [DB10]: Please restructure this sentence. Are these results from your study or some other person's study?

Restructured and discussed to remove ambiguity.

314

315 **4. Knowledge on health outcomes of water-pipe smoking**

316 In this study, 14.4% of the participants had the opinion that water-pipe smoking is not harmful at all,
317 which is similar to a previous study conducted in Malaysia. 17

318 18.9% of the respondents stated that water pipe-smoking was less harmful than cigarette-smoking,
319 which is consistent with a previous research in Malaysia where 14.6% of respondents said the same. 17

320 In this Study, 49.8% of the participants said water-pipe smoking as more harmful to passive-smokers.
321 Meanwhile in Turkey, 41% of the participants agreed with the same. 11

322 It is not surprising that the majority of the respondents say that water-pipe smoking can cause lung
323 diseases and cancer, but only 44% of the participants said water-pipe could be a source of infection.
324 While slightly more than half of them said it could cause heart and mouth diseases.

325 About half of the respondents stated that water-pipe smoking is more harmful to passive-smokers than
326 cigarettes, which could be compared to a study conducted in Turkey where 41% of the participants said
327 the same. 11

328 Concerning social-acceptance of water-pipe smoking, 35.4% of the respondents said it was more
329 socially-acceptable than cigarettes, which is consistent with a study done in the U.S. 24

330 In this Study, 33.3% of the participants said water-pipe is less addictive than cigarettes, whereas less
331 than that (21.7%) was found in one other research done in Malaysia. 27 Participants said WP has less
332 nicotine and tar compared to cigarettes (25.1% and 24.7% respectively).

333 In this Study, 38.3% of the respondents were found to have poor knowledge on water pipe-smoking,
334 while 61.7% had good knowledge. Although more than half of Arab-students have adequate knowledge,

335 prevalence of water-pipe smoking is still high. This could be due to the influence of others, or it could be
336 because of its attractions.

337 Gender was significantly associated with knowledge about water-pipe smoking health-outcomes
338 ($p=0.004$ and $OR=0.642$). 69.2% of male-students had significantly good knowledge, where 49% of
339 female students had poor knowledge.

Comment [DB11]: Was there any reason why they thought water pipe smoking was safer, less addictive and more socially acceptable. What other references do you have to back up your arguments?

The discussion has been elaborated and additional references added to discard ambiguity.

Comment [DB12]: Good knowledge , poor knowledge of what. Please be specific.

Attended to and highlighted. Ambiguity removed.

340 5. Ban on water pipe smoking

341 Banning WP smoking in public places and on minors can bring about an effect on reducing the
342 prevalence of WP smoking. More than half of respondents in this Study had started WP smoking before
343 the age of 18 since there are no regulations that ban minors smoking WP - WP smoking could be
344 purchased and is accessible at many restaurants and cafes.

345 A majority of respondents (69.1%) had strongly agreed to banning minors (< 18) involving in WP
346 smoking, while only 5.3% had disagreed. This is consistent with a study conducted in Lebanon, where
347 the majority of the participants (75.6%) supported banning minors smoking WP. 17 In contrast, one
348 other study conducted in Lebanon also, showed only 16.4% of respondents supported such banning on
349 minors. 28 32.1% of respondents in this Study had strongly agreed to banning WP smoking in bars and
350 restaurants, while some respondents were strongly and somewhat opposed (18.1% and
351 29.6% respectively) to the banning.

352 6. Implications

353 Water-pipe smoking has become a worldwide phenomenon, especially among youth. Why is water-pipe
354 smoking becoming so wide spread and what are the main attractions?

355 To our knowledge, this Study is the first one to estimate the prevalence of WP smoking and assess the
356 knowledge of Arab students in Malaysia. Therefore, the results should motivate other researchers to

357 explore the field and encourage further interventional studies. The Study has given all of us an idea as to
358 the main attractions of WP smoking.

Comment [DB13]: Apart from the flavouring added what were the other attractions?

This has been elaborated on and highlighted.

359 The high prevalence of WP smoking among Arab students seems to be alarming, and it may need
360 intervention by the Malaysian authorities.

361 Our study provides evidence that Regulations and Rules should ban minors involving in WP smoking as
362 well as WP smoking in public places.

363 Our present work contributes to increasing the awareness of the Study-sample with relation to WP
364 smoking. We hope, this will motivate the participants to search for information on WP smoking, and
365 even quit smoking.

366 Our Study creates a need to justify a request to the Malaysian authorities to develop Health-awareness
367 Programs on WP smoking and its health-effects.

368 There is a need also to encourage other researchers to conduct more studies not just on WP smoking,
369 but other forms of tobacco-use as well.

370 **Conclusions**

371 This Study indicates a high prevalence of WP smoking (33.7%). Male students had a higher prevalence
372 than female (37.1% and 29% respectively). People with poor knowledge regarding water-pipe smoking
373 were found to be 38.3% of the Study sample.

374 To our knowledge, this Study is the first cross-sectional study estimating the prevalence of WP smoking
375 among Arab students in Malaysia. The high prevalence of WP smoking in this study indicates the need to
376 provide better Regulations on WP smoking, especially among minors.

377 There is a need to encourage authorities to ban WP smoking in public places and ban minors from
378 smoking WP. We should also encourage researchers to conduct more studies in this important field to
379 provide more information among different population groups.

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