Attitudes and Knowledge of the Harmful Effects of Waterpipe Tobacco Smoking among university students: A study from Jordan

Nour A. Al-Sawalha¹ · Basima A. Almomani¹ · Samah F. Al-Shatnawi¹ · Bashar N. Almomani²

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Abstract

Waterpipe tobacco smoking (WTS) is an emerging behavior worldwide, especially among the youth. It continues to spike in the Middle-Eastern region. WTS is associated with many harmful health-related outcomes.

Objective: Herein, the attitude, knowledge, and factors affecting the knowledge of university students toward the detrimental effects of WTS were examined. This was a cross-sectional study where university students filled an online questionnaire that was available between October 2019 and May 2020. A total of 966 questionnaires were filled. About 40% of participants were current waterpipe smokers. Around 30% of participants stated that WTS is not addictive, and about third of them indicated that smoking waterpipe is an essential part of social gathering and is socially accepted behavior. Half of participants (55.8%) were knowledgeable about the major harmful consequences of WTS. Older students were more knowledgeable as compared to younger ones. In contrast, students from non-medical colleges and waterpipe smokers were less knowledgeable in comparison to those in medical colleges and non-smokers, respectively. More targeted health campaigns to control the use of WTS among university students should be implemented.

Keywords Waterpipe tobacco smoke · Knowledge · Attitude · University students · Harmful effects

Introduction

Waterpipe tobacco smoke (WTS) is an internationally accepted trend of smoking (Maziak et al. 2004). Waterpipe smoking was promoted as a safer alternative to cigarette smoking since it was invented by Hakim AbulFath, an Indian physician. This misconception is due to passing the smoke through the water (Chattopadhyay 2000). The waterpipe apparatus is composed of a head where the flavored tobacco is placed, a metallic body that connects the head to the glass bottle, a glass bottle that is half-filled with water and a hose that connects the bowl with a mouthpiece. The tobacco is placed in the head and is covered

with perforated aluminum foil where the heated charcoal is placed (Akl et al. 2011; Gatrad et al. 2007).

Worldwide, in 2007, around 100 million individuals smoked waterpipe on daily basis (Gatrad et al. 2007). The popularity of waterpipe smoking has increased dramatically in several countries, especially among youth population, and it even replaced cigarette smoking as a popular form of tobacco consumption (Akl et al. 2011). The prevalence of waterpipe smoking among youth is excessively high in European and Middle-Eastern countries, and it is the highest among adults in the Middle-Eastern countries (Jawad et al. 2018).

The rate of waterpipe smoking has increased in several countries. Soulakova and colleagues reported an increased rate of current WTS use (from 1 to 2%) and ever-used (from 7 to 12%) among 55,352 young adults (18–30 years old) in the USA during the period from 2010–2011 to 2014–2015 (Soulakova et al. 2018). Further, the prevalence of WTS was 4.8% among international medical students in Germany and Hungary (Balogh et al. 2018). In Lebanon, the overall prevalence of WTS among university students was 21.1% and 11.3% for those who smoked both cigarettes and waterpipe (Tamim et al. 2003). In Jordan, 61.1% of male university students had ever consumed WTS while 42.7% used WTS

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✉ Nour A. Al-Sawalha
nasawalha@just.edu.jo

¹ Department of Clinical Pharmacy, Faculty of Pharmacy, Jordan University of Science and Technology, P.O. Box 3030, Irbid 22110, Jordan

² Ministry of Health, National Institute of Forensic Medicine, Amman, Jordan

at least monthly (Azab et al. 2010). In addition, it has been found that 53% of females university students from Jordan preferred WTS (Dar-Odeh et al. 2010). The prevalence of WTS among Jordanian women has increased drastically in the 21st century (Jawad et al. 2016). The prevalence was 4.1% in 2002 and reached 10.2% in 2012 (Jawad et al. 2016), and prevalence of women who smoked WTS was almost as high as cigarette smoking (10.2% vs. 10.9%) (Jawad et al. 2016).

Waterpipe tobacco smoking results in several detrimental health effects. Waterpipe tobacco smoke exposure increases the risk of developing cardiovascular diseases such as increased blood pressure and risk of coronary artery disease (Bhatnagar et al. 2019). Further, it increases the risk of developing diabetes and metabolic syndrome (Saffar Soflaei et al. 2018), respiratory diseases (El-Zaatari et al. 2015), male infertility Fawzy (2011), cognitive deficit (Meo et al. 2017), and cancer (Montazeri et al. 2017). Moreover, several studies showed that WTS exposure during pregnancy affects the offspring negatively. Prenatal waterpipe tobacco smoke is associated with low birth weight (Abusalah et al. 2012; Bachir and Chaaya 2008; Bener et al. 2012; Rachidi et al. 2013; Tamim et al. 2008), infant mortality (Singh et al. 2013), as well as pulmonary complications at birth (Rachidi et al. 2013). Given the strikingly large incremental rate of WTS in some countries including Jordan, it is important to understand the factors that might have led the expansion in this behavior.

Previous studies have examined the knowledge and attitude of university students to WTS. It has been shown that waterpipe smoking among university students in Jordan was associated with upper middle income level as well as male gender (Azab et al. 2010). A cross-sectional study that was conducted in five Mediterranean countries revealed that most university students had misperceptions of waterpipe harm (Abu-Rmeileh et al. 2018). Such findings highlight the needs to increase the awareness of university students about the harmful effects of WTS. Though university students realized that WTS cessation prevented the harmful effects, they continued waterpipe smoking to not lose their social life with friends and eliminate the pleasure effects of reduced anxiety and fatigue (Khani Jeihooni et al. 2018). In the light of increased scientific evidence about the consequences of waterpipe smoking, there is a need to examine the attitude, knowledge, and factors affecting the knowledge of university students toward the harmful effects of WTS.

Subjects and methods

Study population and design

This was a cross-sectional questionnaire based observational study. University students ($n = 966$) who were attending

public and private universities in North, Middle, and South Jordan were invited to participate in the study and filled the online questionnaire. The online questionnaire was available from October 2019 till May 2020. The questionnaire was developed based on the literature (Abu-Rmeileh et al. 2018; AlQahtani 2017; Arshad et al. 2019; Awan et al. 2016) and discussion within the research team. The questionnaire was tested for face validity by experts in the field, and it was piloted ($n = 20$) to improve the clarity of the questions. The questionnaire was developed in English then it was translated to Arabic.

The questionnaire contains four main sections; demographics, smoking habits, attitude, and knowledge sections. The questionnaire includes closed-ended questions. The attitude section is composed of 5 items with 5-point Likert scale (“strongly agree” to “strongly disagree”). Cronbach’s α (alpha) of attitude section was 0.72 which indicated a good reliability. The knowledge section composed of 12 items with 3 answer options (true, false, do not know). The approximate time to complete the questionnaire was 10–15 min.

Statistical analysis

Categorical variables were presented as numbers and percent, and the continuous variables were presented as median (inter-quartile range). The univariate analysis was performed using Mann–Whitney U test for continuous variables and chi-square test for categorical variables as appropriate. The answers to different knowledge questions were calculated as categorical variables using a cutoff point for total scores. Participants who answered ≥ 7 questions were categorized as knowledgeable while those who answered < 7 questions were categorized as non-knowledgeable. Binary logistic regression analysis was used to determine factors that are independently associated with participants’ knowledge. All participants who answered “do not know” were considered “incorrect.” For the purpose of analysis in attitude section, both answer options “agree” and “strongly agree” were combined as one category and both “disagree” and “strongly disagree” as one category. p -value ≤ 0.05 was considered statistically significant. The analysis was performed utilizing Statistical Package for Social Sciences (SPSS Inc., Chicago, IL) version 20.

Results

Demographic data of participants

A total of 966 students participated in the current study. Most participants were females (67%) and studied in governmental universities (88%). More than half of participants (59%) were enrolled in medical college and were in their first and second year of college (~50%). Almost half of participants (~50%)

lived in Middle Jordan. Less than half of participants (45%) received less than 100 Jordanian Dinar (JD) as a pocket money per month (Table 1).

Smoking habits of participated students

Only 16.6% of participants were current cigarette smokers, while 40.5% of them were waterpipe smokers. A quarter of waterpipe smokers (26.9%) smoked it daily, and ~65% of them spent 30–90 min in each smoking session. About half of participants (49%) smoked waterpipe in the house, and ~41% of them tried it for the first time for curiosity purposes (Table 2).

Attitude of participated students toward waterpipe smoking

About 16% and ~29% of participants agreed that smoking waterpipe is less dangerous and not addictive as compared

Table 1 Demographics and characteristics of participants

Characteristics ^a	All participants ^b <i>n</i> = 966
Age ^c	20 (19–21)
Gender	
• Female	649 (67.2)
• Male	317 (32.8)
University	
• Governmental	855 (88.6)
• Private	110 (11.4)
College	
• Medical	560 (58.6)
• Not medical	396 (41.4)
Year of study	
• 1st and 2nd	469 (49.8)
• 3rd and 4th	376 (39.9)
• 5th and 6th	97 (10.3)
Area of residence	
• North	377 (39.3)
• South	109 (11.4)
• Middle	474 (49.4)
Pocket money spent monthly	
• <100 JD	431 (44.9)
• 100–300 JD	383 (39.9)
• >300 JD	146 (15.2)

^a All data expressed as *n* (%) of participants unless otherwise indicated

^b Values were calculated based on the number of students who responded to the correspondent question

^c Data described as median (IQR)

Table 2 Smoking habits of participants

Characteristics ^a	All participants ^b <i>n</i> = 966
Current cigarette smokers	
• No	796 (83.4)
• Yes	159 (16.6)
Current waterpipe smoker	
• No	574 (59.5)
• Yes	391 (40.5)
Frequency of waterpipe smoking	
• Daily	105 (26.9)
• 1–2 times per week	124 (31.8)
• 1–2 times per month	161 (41.3)
Duration of each waterpipe smoking session	
• Less than 30 min	109 (28)
• 30–90 min	252 (64.8)
• >90 min	28 (7.2)
Place of waterpipe smoking	
• House	191 (49)
• Friend's house	42 (10.8)
• Relatives' house	19 (4.9)
• Public place (cafés/restaurants)	138 (35.4)
Reason behind waterpipe smoking for the first time	
• Curiosity	158 (40.5)
• Seeking for pleasure	133 (34.1)
• Forming relationships with colleagues	11 (2.8)
• Becoming free from community constraints	8 (2.1)
• Others	80 (20.5)

^a All data expressed as *n* (%) of participants

^b Values were calculated based on the number of students who responded to the correspondent question

to cigarette smoking respectively. In addition, about third of participants indicated that smoking waterpipe is an essential part of social gathering and is socially accepted behavior. However, only 18% of them considered it as a mental stimulant (Fig. 1).

Knowledge of participated students

Most participants (~71%) stated that waterpipe is composed of natural products, and more than half of them (55%) had the misconception that, as smoke passes the water, harmful substances are filtered. However, only 27% of participants knew that a 1-h waterpipe smoking session involves 200 puffs compared to 20 puffs for cigarette smoking.

The majority of participants (>80%) knew that waterpipe smoking increases the risk of developing cardiovascular and respiratory diseases as well as developing cancer. However, less than half of them knew that waterpipe smoking negatively affects the cognition and increased risk of developing metabolic syndrome and diabetes. Further, less than third of participants (~24%) knew that waterpipe tobacco smoke exposure increases the risk of male infertility.

Fig. 1 Attitude of participants toward waterpipe smoking. Values were calculated based on the number of students who responded to the correspondent question

Approximately 63% of participants knew that waterpipe smoking during pregnancy increases the risk of pulmonary complication at birth. However, less than half of them knew the harmful effects of waterpipe smoking during pregnancy on low birth weight as well as the increased infant mortality. Table 3 summarizes the correct responses to knowledge questions.

Factors affecting knowledge of participated students

More than half of university students were knowledgeable about the harmful consequences of WTS (55.8%, $n = 539$). The results of multivariate analysis of factors affecting students' knowledge are presented in Table 4. Older students were more knowledgeable than younger ones (OR = 1.194,

95% CI 1.087–1.311, p value < 0.001). On the other hand, students from non-medical college were less knowledgeable than those in medical college (OR = 0.575, 95% CI 0.430–0.769, p value < 0.001). In addition, waterpipe smokers were less knowledgeable than non-smokers (OR = 0.554, 95% CI 0.413–0.742, p value < 0.001).

Discussion

Given the alarmingly high rates of waterpipe smoking among youth in Jordan, this research was conducted to examine the attitude and knowledge of university students about the harmful effects of WTS.

Table 3 Overview of participants' knowledge

Knowledge items	Correct answer <i>n</i> (%)
Waterpipe is composed of natural products	679 (70.7)
The water filters the harmful substances that are present in waterpipe	531 (55)
A 1-h waterpipe smoking session involves 200 puffs compared to 20 puffs for cigarette smoking	259 (26.9)
Waterpipe tobacco smoke exposure increases the risk of developing cardiovascular diseases as increased blood pressure and coronary artery disease	834 (86.7)
Waterpipe tobacco smoke exposure increases the risk of respiratory diseases as chronic bronchitis	853 (88.6)
Waterpipe tobacco smoke exposure increases the risk of cancer as lung cancer and esophageal cancer	836 (86.9)
Waterpipe smoking negatively affects the cognitive functions such as attention, alertness, and memory	436 (45.3)
Waterpipe tobacco smoke exposure increases the risk of diabetes and metabolic syndrome	379 (39.4)
Waterpipe tobacco smoke exposure increases the risk of infertility in males	227 (23.5)
Prenatal waterpipe tobacco smoke is associated with pulmonary complications at birth	609 (63.2)
Prenatal waterpipe tobacco smoke is associated with low birth weight	461 (47.9)
Prenatal waterpipe tobacco smoke is associated with infant mortality	449 (46.7)

Table 4 Multivariate analysis of factors affecting participants' knowledge

Factors ^a	OR (95% CI)	<i>p</i> value
Age ^b	1.194 (1.087–1.311)	<0.001
Gender		
• Female	Ref	0.186
• Male	0.804 (0.582–1.111)	
College		
• Medical	Ref	<0.001
• Not medical	0.575 (0.430–0.769)	
Year of study		
• 1st and 2nd	Ref	0.155
• 3rd and 4th	0.764 (0.548–1.065)	0.112
• 5th and 6th	1.089 (0.587–2.021)	0.787
Pocket money spent monthly		
• <100 JD	Ref	0.246
• 100–300 JD	1.299 (0.956–1.765)	0.094
• >300 JD	1.145 (0.758–1.730)	0.519
Current waterpipe smoker		
• No	Ref	<0.001
• Yes	0.554 (0.413–0.742)	
Current cigarette smoker		
• No	Ref	0.794
• Yes	1.056 (0.701–1.590)	

^a All data expressed as *n* (%) of participants unless otherwise indicated

^b Data described as median (IQR)

About 40% of enrolled participants indicated current waterpipe smoking compared to ~17% who were cigarette smokers. This highlights the shift in popularity from cigarette smoking to waterpipe smoking among university students of Jordan, consistent with university students in USA (Barnett et al. 2013). The rate of waterpipe smoking is considered high as compared to previously reported overall rates of smoking from international, national, and local studies in the Middle-Eastern region. A previous study in Jordan revealed that the prevalence of waterpipe smoking was ~19% among adult males and ~23% among adult females (Abu-Helalah et al. 2015). In addition, the prevalence rate among Arab youth varies (13–15 years old) in different countries; for example, it was 0.9% in Oman, ~19% in Jordan, ~7% in Egypt, and ~34% in Lebanon (Kheirallah et al. 2016). The higher prevalence in the current study can be explained by the difference in age groups, as focused on university students. Furthermore, it has been reported that 8.4% of the surveyed college and university students in USA were current waterpipe smokers (Primack et al. 2012). This highlights the alarming increased popularity and acceptance of WTS among university students in Jordan.

Nearly 27% of waterpipe smokers in this research smoked it on daily basis, and 65% of them spent 30–90 min in each WTS session. Even though female gender was majority in this

study, smoking rates were significantly high, and no significant difference was found between rates reported by females vs. males. Such findings confirm the continuous increments in WTS habits (Abu-Helalah et al. 2015) among young age females in Jordan (Abu-Helalah et al. 2015). Attitudes of WTS in youthful communities (e.g., colleges and universities) in Jordan might have resulted in such transition in WTS behaviors across genders (Taylor et al. 1998).

In the current study, around 16% and 29% of students perceived WTS in comparison to cigarette smoking, as being safer on health and not addictive behavior, respectively. This rate is lower than rates reported in other studies (Arshad et al. 2019; Jawaid et al. 2008), which reflects better knowledge about the harmful effects of WTS among study participants. It has been shown that the general perception among university students was that WTS is less harmful and addictive and is socially acceptable as an alternative to cigarette smoking (Arshad et al. 2019). Noteworthy, participating university students in this study considered WTS behavior as not only being socially accepted but also as an essential part of their social gathering activities. In concordance to regional findings, such attitudes might have contributed to the current emerging public health problem of WTS behavior among youth generations (Abu-Helalah et al. 2015; Azab et al. 2010). The overall acceptability of WTS behavior might have been gained because of the growing popularity of such behavior across genders in Jordan; Waterpipe is part of the menu in almost all restaurants in Jordan. As reported by 35.4% of waterpipe smokers, public places are the main places for WTS in this study. Therefore, low prices and accessibility to widespread waterpipe cafés might be considered influential factors to the reported attitudes WHO (n.d.). Regarding local distribution of waterpipe cafés in Jordan (on Google maps), anyone can easily notice the high density of these shops in locations nearby college campuses and student dormitories. Insufficient regulations that control licenses offered by the Jordanian government to cafés and restaurants that serve waterpipe might have supported the overall acceptability of WTS behaviors (Samet et al. 2001).

Concerning their knowledge about harmful effects of WTS, a large proportion of study participants (55.8%) were knowledgeable about these effects. Whereas, results from previous international studies have indicated poor knowledge about WTS harms among current waterpipe smoking university students (Alqahtani et al. 2019; Arshad et al. 2019; Awan et al. 2016; Jawaid et al. 2008). About 15% of university students at medical fields in Saudi Arabia failed to recognize a single harmful effect of WTS (Awan et al. 2016). Worldwide, and similar to current findings, students were generally able to identify cardiovascular, respiratory, and cancer-related harmful consequences of WTS (Arshad et al. 2019). However, more than half of study participants were not able to identify the negative consequences of WTS that are related to mental and cognitive effects as well as productivity,

pregnancy, and neonatal related harms. This might be due to unavailability of comprehensive information about harmful consequences that are related to WTS. Similar to previous research findings (Arshad et al. 2019), in comparison to non-waterpipe smokers, and as predicted, current smokers were less knowledgeable about negative harms. Thus, more comprehensive rather than general knowledge of health threats related to WTS might influence the current status of WTS among university students. Unsurprisingly, older students and those who are medically oriented were more knowledgeable about harmful effects of WTS as compared to their counterparts. Maturation and medical information from the field of study might improve knowledge level of WTS harms. However, a very recent systematic review that has explored attitudes and knowledge about WTS among university students concluded that knowledge about the general hazards of WTS might not deter the behavior of WTS (Arshad et al. 2019). Thus, prevention programs (targeting public population and/or university students) that aim to control WTS should not focus on increasing knowledge and awareness of harmful consequences only. Rather, programs should be multifaceted by integrating aspects of policy, religious, and family-related perceptions, beside educating students about adverse effects of WTS to effectively interfere with such complex behaviors. This highlights the needs for more organized governmental efforts in developing general and university-based policies that target waterpipe smoking among youth and adults.

The current study has several limitations. First, it utilized an online questionnaire where there is a risk of sample selection bias. However, current university students are very familiar and frequently visiting many different online portals Kunsoo Park et al. (2019); thus, such method seems practical and feasible (saving time and costs of conventional data collection and enhancing the generalizability of study findings) as it might have facilitated responses from different geographical regions in Jordan, especially during COVID-19 pandemic (Lefever et al. 2007). Therefore, the presented data might reflect the general attitude and knowledge of the targeted population of university students. Second, this study is cross-sectional; thus, documented findings may not reflect the actual temporal effects of knowledge advancement on the actual behaviors of WTS. Third, the current study did not assess dual use of both cigarettes and waterpipe and did not differentiate between attitudes among smokers and ex-smokers. Fourth, the translated Arabic version of the questionnaire has not been validated.

In conclusion, the university students in Jordan report extensive use of WTS. Both genders highlight the general acceptance of WTS behavior as a core activity during their social gathering. They have indicated wrong perceptions about WTS, as being less harmful and non-addictive when compared to cigarette smoking. More targeted university-based

health campaigns should be implemented to control the use of WTS among students. Application of interventional efforts that curb WTS among university students in particular might be through different modes including online approaches such as emails and social media.

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Author contribution NAS conceptualized the work, developed the questionnaire, collected the data, and assisted in data analysis and writing the manuscript. BAM developed the questionnaire, collected the data, analyzed the data, and revised of the manuscript. SFS assisted in data analysis and wrote the manuscript. BNA assisted in data collection and revised the manuscript. All authors read and approved the final manuscript.

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Data availability All data generated or analyzed during this study are included in this published article.

Declarations

Ethics approval and consent to participate This study was approved by the institutional review board (IRB) at Jordan University of Science and Technology (JUST) before conducting the study (reference number 13/126/2019).

Consent for publication Not applicable

Conflict of interest The authors declare no competing interests.

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