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# Knowledge, Attitudes, and Practices Towards Waterpipe Smoking Among Medical And Non-Medical University Students

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Article information	Abstract
<p><b>Article history:</b>                      Received August 21, 2023                      Accepted December 15, 2023                      Available online June 12, 2024</p>	<p><b>Background:</b> Waterpipe smoking is becoming a more popular method of tobacco consumption and is associated with short- and long-term health effects. WPS is rising worldwide, especially among university students. Thus, this study examined medical and nonmedical university students' waterpipe smoking knowledge, attitudes, and practices.</p> <p><b>Methods:</b> A cross-sectional study was conducted at the University of Duhok, Duhok city, Kurdistan region, Iraq, from June 4th, 2023, to October 5th, 2023. The study included a sample of 200 students comprising both medical and non-medical students. The selection of participants was carried out using a convenience sampling technique. To collect data, a structured and validated self-administered questionnaire was utilized. The collected data were then analyzed using SPSS version 23, with a significance level set at <math>p\text{-value} \leq 0.05</math>.</p> <p><b>Results:</b> The study revealed that 59% of students aged 21–23, with males comprising the majority (71%), Medical students demonstrated greater knowledge about the increased risks of cancer (<math>p\ 0.000</math>), respiratory diseases (<math>p\ 0.000</math>), cardiovascular hazards (<math>p\ 0.000</math>), water pipe infection transmission (<math>p\ 0.003</math>), the effect on spermatozoa characteristics (<math>p\ 0.000</math>), and parenteral WPS and low birth weight (<math>p\ 0.008</math>). Despite non-significant differences in WPS attitudes between medical and non-medical ones, 56% of students considered WPS more socially acceptable than cigarettes, with 60% feeling it relaxed and 55.5% helping manage stress. The majority of students practice WPS at cafes or restaurants (41%), with friends (74%), on a weekly basis (61%), and express an intention to quit (60.5%). Non-medical students exhibit a higher frequency of weekly WPS use and monthly smoking compared to medical students (<math>p\ 0.009</math>).</p> <p><b>Conclusions:</b> The results demonstrate the concerning WPS practices among both medical and non-medical students. As a result, urgent action is necessary to address this issue through heightened awareness efforts and the implementation of anti-smoking policies.</p>
<p><b>Keywords:</b>                      Waterpipe Smoking                      Knowledge                      Attitudes                      Practices                      University Students</p>	
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## INTRODUCTION

Waterpipe smoking (WPS), also referred to as shisha, hookah, goza, hubble-bubble, kalia, narghile, argeela, okka, ghelyoon, and ghalyan, is a form of smoking that has gained popularity in recent years (Neergaard, Singh, Job & Montgomery, 2007). Tobacco use is a significant contributor to mortality on a global scale. The World Health Organization (WHO) reports that in 2017, over 6 million deaths worldwide were attributed to tobacco exposure, whether through direct use or second-hand exposure (WHO, 2016). WPS has become increasingly popular as a recreational activity over the past twenty-five years (Akl et al., 2015; Arshad et al., 2019).

WPS origins can be traced back to the late sixteenth century, with its use documented in the Middle East. Notably, the Eastern Mediterranean Region (EMR) experienced an increase in the rate of tobacco use, which has been practiced as a traditional habit in this region for many years (Alhawsawi et al., 2019; Kargar & Ansari-Moghaddam, 2023). The trend of WPS has seen a significant increase among younger generations since the 1990s (Alhawsawi et al., 2019; Akl et al., 2011). This tendency has been especially visible among young people in Asian, African, and Western nations, including England, France, Russia, Australia, Canada, and the US (Maziak, 2011). WTS is becoming more common internationally (Akl et al., 2015; Arshad et al., 2019).

Studies examining the prevalence of WTS have indicated that university students exhibit some of the highest prevalence rates globally. For instance, in Lebanon, the prevalence of waterpipe smoking was found to be 29% (Jradi, Wewers, Pirie, Binkley & Ferketich, 2013). Similarly, a study conducted in four Jordanian universities revealed that the incidence of current waterpipe smokers among university students was 30% (Khabour et al., 2012). Other Arab countries reported a prevalence ranging from 5.6% to 19.8% (Nasser & Zhang, 2019; Mandil, Hussein, Omer, Turki, & Gaber, 2007). In Iran, the prevalence of waterpipe smoking was approximately 25% (Khodadost et al., 2020). It is worth noting that while waterpipe smoking is already popular in the Middle East; its popularity is also increasing in other countries (Almogbel et al., 2021).

Several factors contribute to the rise in WP consumption. One reason for the increased popularity of WP is the lack of knowledge about its potential complications, which leads to a higher acceptance and prevalence of WP use among different populations (Momenabadi, Iranpour, Khanjani, & Mohseni, 2015; Dehdari, Jafari, & Joveyni, 2012). Another factor is its use as a social behavior for socializing, relaxation, pleasure, and entertainment (Harakeh & Vollebergh, 2012; Akl et al., 2013). WPS is often viewed as a social activity, and the increasing number of WP supply centers and stores selling related products has made it easier for individuals to partake

in this form of smoking. The availability of affordable and flavored tobaccos has also contributed to the growing popularity of WP consumption (Momenabadi, Iranpour, Khanjani, & Mohseni, 2015; Dehdari, Jafari, & Joveyni, 2012). In addition to these factors, university students also mentioned peer pressure, fashion, and curiosity as additional factors influencing their decision to smoke WP. Moreover, individuals in the Middle East identified expressing cultural identity as an additional motive for smoking WP (Harakeh & Vollebergh, 2012; Akl et al., 2013).

Recent research shows that waterpipe smoke contains nicotine, heavy metals, and toxins found in cigarette smoke. It is also important to note that using a WP can lead to the same levels of nicotine in the blood as smoking 10 cigarettes (Bali et al., 2015; Rahim, Ibrahim, Kamal, 2018). Waterpipe smokers are susceptible to the same diseases that are associated with smoking cigarettes. These diseases include various cancers like lung, head, neck, and gastric bladder cancers (Montazeri, Nyiraneza, El-Katerji & Little, 2017; Waziry, Jawad, Ballout, Al Akel & Akl, (2017; Awan, Siddiqi, Patil & Hussain, 2017), coronary heart disease, shortness of breath, chronic bronchitis, low immunity, and low birth weight (Haddad et al., 2016). Moreover, sharing a waterpipe can potentially increase the risk of transmitting infectious diseases such as tuberculosis, herpes, viral hepatitis, and other infections (Tofighi et al., 2023). The increase in usage of WTS among younger age groups led to the WHO acknowledging it as a significant public health issue in their 2015 advisory note (Chaouachi, 2006). This recognition was based on numerous published studies that emphasized the comparable health risks associated with WTS and cigarette smoking (Waziry, Jawad, Ballout, Al Akel & Akl, 2017).

One possible explanation for the widespread appeal of WPS, even among individuals who do not typically smoke tobacco, could be attributed to a lack of awareness regarding the harmful effects associated with this practice (Nuzzo et al., 2013). The aim of this study is to determine knowledge, attitudes, and practices towards WPS among medical and non-medical university students.

## MATERIALS AND METHODS

### Study design and setting

A descriptive cross-sectional study design was conducted during the period of June 4th, 2023, to October 5th, 2023. The current study was carried out at the University of Duhok, located in Duhok city within the Iraqi Kurdistan region. The researchers selected 11 departments, including both medical and non-medical ones, from the University of Duhok to collect waterpipe smoker students from these departments.

### Sample size and sampling

The research encompassed 200 university students from both medical and non-medical colleges at the University of Duhok, representing various academic disciplines. The participants were selected from a wide range of departments, including Nursing, Medicine, Dentistry, Pharmacy, health sciences, history, social sciences, geography, English, Arabic, and Kurdish. A convenience sampling method was utilized to collect the sample. These students were current waterpipe smokers, and the study encompassed both male and female individuals aged 18 and above.

### Measurement

A self-administered questionnaire regarding knowledge, attitudes, and practices towards waterpipe smoking was developed in the local language. The questionnaire used in the current study consisted of three parts: the first part included socio-demographic characteristics of the students, such as age, gender, class, marital status, colleges and residency; the second part contained characteristics of Waterpipe smokers; and the third part comprised knowledge, attitudes, and practices towards Waterpipe smoking. The students responded to a series of multiple-choice questions within a time frame of 15 to 20 minutes.

### Data collection and data analysis

The collected data were analyzed through the application of descriptive statistical tests, specifically frequency and percentage analyses. Additionally, the chi-square test was employed, with a significance level of  $P \leq 0.05$ , to compare the knowledge, attitudes, and practices towards WPS between medical and non-medical college students at the University of Duhok.

The inclusion criteria for participants in a study were individuals who are waterpipe smokers, aged 18 years and older, and have provided consent for participation. Conversely, those who do not smoke waterpipe, are under 18 years old, and have not given consent for participation were excluded from the study.

The study's purpose was communicated to the participants through direct interviews, and their willingness to take part in the study was confirmed. Following a brief introduction about the study's purpose, individual questionnaires were administered, and participants were informed about the confidentiality of the collected data. They were not required to disclose any personal information

### Ethical Considerations

The research has received approval from the scientific committee of the College of Nursing at the University of Duhok as well as ethical approval from the research ethical committee in the Directorate of Health in Duhok city with a reference number (31052023-4-1). Furthermore, agreements have been established with the university and colleges involved in the study, and informed consent has been obtained from all participants. The confidentiality of the collected data has been maintained.

## RESULTS

The data in Table 1 indicates that the majority (59%) of students fell within the age group of 21–23. Male participants constituted the majority (71%) of the total participants. Additionally, 57% of the students attended non-medical colleges, with the highest percentage (37%) being in their fourth educational class of college. Furthermore, the vast majority of students were single (95.5%). In terms of residential area, approximately half of them (51%) were urban residents.

The majority of students (59.5%) reported that cafes or restaurants were the first places where water pipe smoking (WPS) initiation occurred. Among students, the most reported age for first-time WPS initiation was 16–18 years old (42%). Additionally, a significant proportion of the students (68%) reported that they intended to engage in WPS for the first time when they were with friends. Regarding the duration, the vast majority of students (69.5%) have been water pipe smokers for one year or more, as shown in Table 2.

Table 3 illustrates that there are significant disparities in knowledge regarding the health risks linked to WPS between medical students and non-medical students. Medical students exhibit significantly higher awareness of the elevated risks of cancer ( $p 0.000$ ), respiratory diseases ( $p 0.000$ ), cardiovascular hazards ( $p 0.000$ ), the transmission of infections through water pipes ( $p 0.003$ ), the effect of WPS on the characteristics of spermatozoa ( $p 0.000$ ), and the link between parenteral WPS and low birth weight ( $p 0.008$ ).

The data in Table 4 illustrates that the majority of students engage in WPS practices at cafes or restaurants (41%), with friends (74%), on a weekly basis (61%), and express an intention to quit (60.5%). A comparison was drawn between medical and non-medical students regarding their use of WP. Non-medical students reported using WP more frequently during the week and were more likely to be monthly smokers compared to medical students. However, medical students who smoked were found to use WP once per week more often than non-medical students ( $p 0.009$ ).

Table 5 presents the attitudes of WP smokers, indicating that a majority of them (56%) consider WP to be more socially acceptable than cigarettes. Additionally, 60% of the students believe that smoking WP induces a sense of relaxation, while 55.5% view it as an effective strategy for coping with stress. Although the majority of students do not believe that water pipe smoking (WPS) enhances intimacy between individuals of the opposite sex (75%), they also do not believe that WPS is a safe habit (87%), makes individuals appear attractive (72.5%), signifies high social status (74%), or that females cannot smoke cigarettes but can smoke WPS (63.5%). Nevertheless, there were no significant differences in these WPS attitudes between medical and non-medical students.

**Table 1: Sociodemographic characteristic of students**

	<b>Characteristics (N=200)</b>	<b>Frequency</b>	<b>Percentage %</b>
<b>Age</b>	18-20	60	30.0
	21-23	118	59.0
	24 and older	22	11.0
<b>Gender</b>	Male	142	71.0
	female	58	29.0
<b>Colleges</b>	Medical	86	43.0
	Non-medical	114	57.0
<b>Classes</b>	First class	31	15.5
	Second class	42	21
	Third class	47	23.5
	Fourth class	74	37
	Fifth class	4	2.0
	Sixth class	2	1.0
<b>Marital status</b>	Single	191	95.5
	Married	9	4.5
<b>Residency</b>	Urban	102	51.0
	Rural	52	26.0
	Suburban	46	23.0

N Number

**Table 2: Factor associated with intent to WPS behavior**

	<b>Factors associated with WPS initiation (N=200)</b>	<b>Frequency</b>	<b>Percentage %</b>
<b>First place of WPS initiation</b>	Cafe or restaurant	119	59.5
	Home	33	16.5
	Own dorm room	7	3.5
	Family members home	19	9.5
	Fraternity/sorority house	2	1.0
	Friends or acquaintance home	15	7.5
	Someone else room	5	2.5
<b>Age of first time using WP</b>	13-15	38	19.0
	16-18	84	42.0
	19-21	60	30.0
	22-24	15	7.5
	25-29	3	1.5
<b>First time of WPS initiation</b>	I was alone	13	6.5
	With friend/s	136	68
	With a family members	51	28
<b>Duration of WPS</b>	Less than one year	61	30.5
	One year and more	139	69.5

N Number

**Table 3: Knowledge toward waterpipe smoking between medical and non-medical students**

Knowledge towards WPS	F (%)	Medical students F (%)	Non-medical students F (%)	P value
<b>WPS is harmful to the health</b>				
Yes	190 (95)	83 (96.5)	107 (93.9)	0.68
No	7 (3.5)	2 (2.3)	5 (4.4)	
I don't	3 (1.5)	1 (1.2)	2 (1.8)	
<b>WPS Increases risk of cancer</b>				
Yes	159 (79.5)	81 (94.2)	78 (68.4)	0.000
No	19 (9.5)	3 (3.5)	16 (14.0)	
I don't	22 (11.0)	2 (2.3)	20 (17.5)	
<b>WPS increases risk of respiratory diseases</b>				
Yes	176 (88)	85 (98.8)	91 (79.8)	0.000
No	13 (6.5)	1 (1.2)	12 (10.5)	
I don't	11 (5.5)	0 (0.0)	11 (9.6)	
<b>WPS increases risk of cardiovascular hazards</b>				
Yes	146 (73)	75 (87.2)	71 (62.3)	0.000
No	23 (11.5)	6 (7.0)	17 (14.9)	
I don't	31 (15.5)	5 (5.8)	26 (22.8)	
<b>WPS Spread infection by waterpipe</b>				
Yes	143 (71.5)	70 (81.4)	73 (64.0)	0.003
No	35 (17.5)	6 (7.0)	29 (25.4)	
I don't	22 (11)	10 (11.6)	12 (10.5)	
<b>WPS may harm unborn babies and passive smokers</b>				
Yes	153 (76.5)	67 (77.9)	86 (75.4)	0.177
No	25 (12.5)	7 (8.1)	18 (15.8)	
I don't	22 (11)	12 (14.0)	10 (8.8)	
<b>WP contains more nicotine than cigarette</b>				
Yes	98 (49)	50 (57.5)	48 (42.5)	0.084
No	55 (27.5)	18 (20.7)	37 (32.7)	
I don't	47 (23.5)	19 (21.8)	28 (24.8)	
<b>WP more addictive than cigarette</b>				
Yes	85 (42.5)	36 (41.9)	49 (43.0)	0.48
No	91 (45.5)	37 (43.0)	54 (47.4)	
I don't	24 (12)	13 (15.1)	11 (9.6)	
<b>Waterpipe is less harmful than cigarette</b>				
Yes	53 (26.5)	22 (25.6)	31 (27.2)	0.53
No	128 (64)	58 (67.4)	70 (61.4)	
I don't	19 (9.5)	6 (7.0%)	13 (11.4)	
<b>WPS affects spermatozoa characteristics</b>				
Yes	52 (26)	35 (40.7)	17 (14.9)	0.001
No	65 (32.5)	18 (20.9)	47 (41.2)	
I don't	83 (41.5)	33 (38.4)	50 (43.9)	
<b>Parenteral WPS associated with LBW</b>				
Yes	75 (37.5)	42 (48.8)	33 (28.9)	0.008
No	21 (10.5)	5 (5.8)	16 (14.0)	
I don't	104 (52)	39 (45.3)	63 (57)	

F frequency, % percentage, Significance level set at p-value ≤0.05

Practices towards WPS	F (%)	Medical students F (%)	Non -medical students F (%)	P value
<b>Place</b>				
Café or restaurants	83 (41.5)	40 (46.5)	43 (37.7)	0.204
Home	44 (22)	14 (16.3)	30 (26.3)	
Anywhere	73 (36.5)	32 (37.2)	41 (36.0)	
<b>With whom</b>				
I was alone	11(5.5)	5 (5.8)	7 (6.1)	0.52
With friends	148 (74%)	67 (77.9)	81 (71.1)	
With a family members	41 (20.5)	14 (16.3)	26(22.8)	
<b>Frequency</b>				
One a month	78 (39.0)	29 (33.7)	49 (43.0)	0.009
One a week	24 (12.0)	18 (20.9)	6 (5.3)	
2-3 a week	51 (25.5)	21 (24.4)	30 (26.3)	
More than 3 times weekly	47 (23.5)	18 (20.9)	29 (25.4)	
<b>Intent to quit WPS</b>				
Yes	119 (59.5)	52 (60.5)	67 (58.8)	0.88
No	81 (40.5)	34 (39.5)	47 (41.2)	

**Table 4: WPS practices between medical and non-medical students**

F frequency, % percentage, Significance level set at p-value  $\leq 0.05$

**Table 5: WPS attitudes between medical and non-medical students**

Attitudes towards WPS	F (%)	Medical Students F (%)	Non-medical students F (%)	P value
<b>WP more acceptable than cigarette</b>				
Agree	112 (56.0)	51 (59.3)	61 (53.5)	0.47
Disagree	88 (44.0)	35 (40.7)	53 (46.5)	
<b>WPS makes one loo relaxed</b>				
Agree	120 (60.0)	51 (59.3)	69 (60.5)	0.88
Disagree	80 (40.0)	35 (40.7)	45 (39.5)	
<b>WPS is good stress coping strategies</b>				
Agree	111 (55.5)	49 (57.0)	62 (54.4)	0.77
Disagree	89 (44.5)	37 (43.0)	52 (45.6)	
<b>WPS add intimacy among person opposite sex</b>				
Agree	50 (25.0)	21 (24.4)	29 (25.4)	0.51
Disagree	150 (75.0)	65 (75.6)	85 (74.6)	
<b>WPS it is a safe habit</b>				
Agree	26 (13)	9 (10.47)	14 (12.28)	0.83
Disagree	174 (87.0)	77 (89.53)	100 (87.72)	
<b>WPS makes ones look attractive</b>				
Agree	55 (27.5)	27 (31.4)	28 (24.6)	0.33
Disagree	145 (72.5)	59 (68.6)	86 (75.4)	
<b>WPS is a sign of high social status</b>				
Agree	52 (26.0)	24 (27.9)	28 (24.6)	0.62
Disagree	148 (74.0)	62 (72.1)	86 (75.4)	
<b>Females cannot smoke cigarette but can smoke WP</b>				
Agree	73 (36.5)	26 (30.2)	47 (41.2)	0.138
Disagree	127 (63.5)	60 (69.8)	67 (58.8)	

F frequency, % percentage, Significance level set at p-value  $\leq 0.05$

## DISCUSSION

The majority of WP smokers in the current study were between the ages of 20 and 22 and in their final year of college, which is the final educational class for all colleges, excluding certain specialized majors such as general medicine, pharmacy, dentistry, and architectural engineering. Previous research has also shown that older university students tend to have a higher likelihood of smoking WP (Bahri et al., 2018; Othman, Kasem & Salih, 2017)

The vast majority of WP smokers in the current study were male students. This finding is consistent with previous studies conducted in the Kurdistan region, which also showed a significantly lower prevalence of WP smoking among females compared to males (Othman, Kasem & Salih, 2017). This trend of lower smoking rates among females has been observed in multiple studies (Shalaby, & Soliman, 2019; Abu-Rmeileh et al., 2018; Zielińska-Danch, 2019). This pattern is not limited to a specific region but has been observed in various Arab countries. It has been observed that in most Eastern Mediterranean Region (EMR) countries, WP tobacco smoking (WTS) rates are slightly higher among boys compared to girls (Maziak, 2013). However, in the Iranian study, the rates of smoking among males and females were found to be similar, with males at 52% and females at 48%. This finding can be attributed to various cultural factors. Smoking is generally considered taboo, and as a result, females, especially young women, rarely smoke or do not openly reveal their smoking habits to society (Babar, 2016). Another factor is that Kurdish society tends to be more conservative. This conservative nature may lead to females being less likely to disclose their smoking habits, resulting in an underestimation of female smokers in the study (Othman, Kasem & Salih, 2017).

According to the current study, more than half of the WP smokers were found to be urban residents. Consistent results found that being urban residents have a higher prevalence of WP smokers (Othman, Kasem & Salih, 2017; Zielińska-Danch, 2019). The higher prevalence of WP smoking in urban areas can be attributed to various factors. One significant factor is the availability of facilities, such as coffee shops, that provide WP smoking services in major cities. These establishments often offer a social environment conducive to WP smoking, attracting individuals who seek socialization opportunities while engaging in this activity (Othman, Kasem & Salih, 2017). In this study, the majority of university students indicated that the period of 16–18 years of age was the initiation range of WPS. These findings align with a previous study conducted on university students in the Kurdistan region, which revealed alarming results indicating that 76% of WP

smokers had already started smoking WP before joining the university (Akl et al., 2011). Consistent results demonstrated that the majority of WP smokers started this before joining the university, specifically before 18 years of age (Bahri et al., 2018). Previous studies have consistently found that the most common age range for initiating WP smoking among WPS is 16–18 (Rami, Makvana & Thakor, 2015), 14–17 years (Sabahy, Divsalar, Bahreinifar, Marzban & Nakhaee, 2011). The study's findings highlight the growing trend of WP smoking among young individuals, indicating that it is becoming more popular among adolescents.

In our research, we found that peer pressure plays a significant role in the initiation of hookah smoking among individuals. Specifically, friends of hookah smokers were found to be responsible for introducing the majority of hookah smokers to this habit. Previous studies have demonstrated that friends were influential in initiating WP smoking (WPS) among WP smokers (Rami, Makvana & Thakor, 2015; Zielińska-Danch, 2019).

The majority of university students in the current study indicated that they started WPS at cafes and restaurants. Consistent results have been found in previous study in the Kurdistan region among university students (Othman, Kasem & Salih, 2017). Similar results revealed that more than 70% of students from Oman, the UAE, and Egypt started smoking WP in a cafe or restaurant (Abu-Rmeileh et al., 2018). The literature suggests that WPS is becoming more common in EMR countries. While it used to be mainly popular among affluent people in Iraq, nowadays, coffee shops with WP smoking options are widespread and easily accessible to young people. In relation to the duration of using WP, the majority of them reported using it for one year or more. These findings align with earlier research conducted in the Kurdistan region, which also found that 76% of smokers had been using WP for a year or longer (Othman, Kasem & Salih, 2017).

Concerning knowledge toward WPS, the majority of students expressed the belief that WPS has detrimental effects on overall health. A previous study has demonstrated that university students, particularly those with a medical background, possess knowledge about the health consequences associated with WPS (Bahri et al., 2018). However, international studies conducted in the past have revealed a lack of awareness among current university students who engage in WPS regarding the harms of this practice (AlQahtani, 2017; Arshad et al., 2019; Awan, Alrshedan, Al Kahtani, & Patil, 2016).

According to the findings of this study, most students are knowledgeable about the health risks associated with WPS, which include cancers, cardiovascular diseases, respiratory diseases, and spreading infections. Medical students exhibit significantly higher knowledge of these diseases compared to non-medical students. This finding is consistent with previous studies conducted among medical students in

Lebanon and Saudi Arabia, which also highlighted their awareness of the detrimental effects of WP smoking (Al-Sawalha, Almomani, Al-Shatnawi & Almomani, 2021; Bahri et al., 2018). Health schools students possess knowledge about tobacco consumption and its effects, which could enhance their awareness of WPS harms (Bahri et al., 2018). Additionally, most students are also aware of the negative consequences of WTS, such as decreased productivity, passive smoking, and neonatal harms, without significant differences. Recent research indicates that students worldwide have a general ability to recognize the harmful consequences of WTS (Arshad et al., 2019; Jradi, Wewers, Pirie, Binkley & Ferketich, 2013).

The present study revealed a lack of basic knowledge regarding the contents of WPS. Specifically, 51% of the university students were unaware that WP smoking delivers more nicotine to the body compared to cigarettes. Alternatively, some participants believed that WP tobacco does not contain higher levels of nicotine than cigarettes. These findings align with a previous study (Zielińska-Danch, 2019) that also identified a similar lack of awareness youth. Interestingly, these results consistent with those of another study conducted among university students in five Eastern Mediterranean Region countries, less than a quarter of the students (26%) correctly perceived that waterpipe tobacco had higher nicotine content, while 42% believed that cigarettes contained more nicotine (Abu-Rmeileh et al., 2018). This highlights the need for increased awareness among youth.

In the present study, it was found that the majority of students considered WPS to be less addictive than cigarettes. Similarly, in a study conducted on university students in five countries in the Eastern Mediterranean Region, only 11% of all the students believed that WTS is more addictive, while 64% thought that cigarettes were more addictive. In particular, 72% of Jordanian and Palestinian students considered cigarettes to be more addictive than WP smoking (Abu-Rmeileh et al., 2018). Cultural, societal, marketing and advertising strategies are potential reasons for this perception, which can significantly impact public health. This study provides evidence on the perception of addiction among university students and the implications of these findings for public health interventions targeting WPS.

University students generally have limited knowledge about the impact of WPS on spermatozoa characteristics, consistent with the results found in the earlier study (Jradi, Wewers, Pirie, Binkley & Ferketich, 2013). However, medical students have more knowledge than non-medical students. This is due to the awareness and educational subjects related to health during the study process at college and having information available on various substances and habits among medical ones. This highlights the need for more comprehensive education and awareness campaigns

to inform students and the general public about the negative effects of WPS on fertility and other health aspects.

The current study demonstrated that the majority of students found WPS more socially acceptable than cigarettes. This finding aligns with previous research conducted among university students, which has highlighted the social acceptability and easy accessibility of WPS (Othman, Kasem & Salih, 2017; Akl et al., 2011). The popularity of WPS among individuals of all ages, male and female, in Iraq, as well as its availability in most restaurants, may contribute to its overall acceptability. It is important to note that the lack of strict tobacco control policies targeting WP use and its social acceptability may contribute to its high prevalence (Ghafouri et al., 2011).

Most of the students, both medical and non-medical, without significant difference between them, considered that WPS is not any less harmful to health than cigarettes. Research conducted in Karachi has found that both medical and nonmedical university students have similar perceptions of the risks associated with smoking (Jawad et al., 2013). Studies among university students consistently found that most students perceive WPS as not less harmful than cigarettes (Shalaby & Soliman, 2019) and even more harmful to health than cigarette smoking (Othman, Kasem & Salih, 2017). This is in contrast to earlier studies (Maziak, 2013), which showed that university students believed WPS to be less harmful to health than cigarette smoking, particularly among females (Labib et al., 2007).

There is a misconception that hookah smoking is less harmful than cigarette smoking, possibly due to the belief that the use of water in the hookah apparatus filters out toxic substances from the smoke (Kandela, 2000). Hookah smoke contains higher levels of metals such as arsenic, lead, and nickel, as well as significantly more tar, carbon monoxide, and nicotine compared to a single cigarette (Knishkowsky & Amitai, 2005). Despite this, the majority of respondents in the present study were aware of the myths surrounding shisha smoking.

The increase in WP consumption is influenced by various factors. The majority of the students reported that the reason for using WPS was to relax and cope with stress. Consistent with these findings, previous studies among university students showed that a social behavior factor as socializing, relaxation, pleasure, and entertainment are associated with the use of WPS (Harakeh & Vollebergh, 2012; Akl et al., 2013).

The study reveals that the majority of smokers smoke WP weekly, with non-medical college students being more likely to smoke WP on a monthly basis and use it more frequently than medical students. An earlier study reported nearly similar results among university students: in the Kurdistan Region of Iraq, nearly 22% of them reported using WP daily (Othman, Kasem & Salih, 2017), among UK universities, 26% and 52% of students reported using WP at least once a week (Jawad et al., 2013), and in the US,



42% of them were using WPS on a monthly basis or more frequently (Braun, Glassman, Wohlwend, Whewell & Reindl, 2012). In Jordan, 44.1% of medical students engage in hookah smoking, with 25% using it daily or weekly. In Qatar, the majority of medical students smoke hookah on a monthly basis, with 25% using it weekly (Jaam et al., 2016). Iranian medical students also reported high rates of hookah smoking, with approximately 60.7% engaging in this behavior on a monthly basis (Sabahy, Divsalar, Bahreinifar, Marzban & Nakhaee, 2011). These findings highlight the concerning prevalence of WPS among medical students, indicating that a significant portion of university students who have tried it continue to engage in this behavior regularly.

Waterpipe smoking among university students is influenced by various factors, including the location. According to a study, the place is a significant factor in its practice. The majority of university students reported that cafés and restaurants are the main places for WPS. University students in various regions, including the Kurdistan region (52%) (Othman, Kasem & Salih, 2017), Iran (65.7%) (Miri-Moghaddam, Shahrakipour, Nasserli & Miri-Moghaddam, 2019) and Qatar (75.2%) (Jaam et al., 2016), they reported that cafés and restaurants are the main places for WPS. Friendship and peer influence also play a significant role in WPS practice; previous results showed that individuals who engage in WPS tend to smoke with their friends (Jaam et al., 2016; Ghafouri et al., 2011). In Beirut, peer encouragement was found to be the primary factor influencing the current WPS (Afifi, Yeretizian, Rouhana, Nehlawi & Mack, 2010). Additionally, individuals who smoke hookah are more likely to have friends who also smoke hookah (Maziak, 2013; Mohammed, Zhang, Newman & Shell, 2010). Conversely, having friends with negative attitudes towards smoking has been associated with lower rates of WPS (Salameh et al., 2014). Overall, the location and influence of friends and peers significantly influence WPS practice among university students.

The majority of university students reported their intention to quit smoking. According to previous studies among university students in the Kurdistan region, 52% have expressed their intention to quit smoking, but only 49% have tried in the past (Othman, Kasem & Salih, 2017). In the faculty of medicine at KSA, 67.5% of smokers expressed their desire to quit, but only 75% had made serious attempts (Shalaby & Soliman, 2019). This suggests that while a significant proportion of university students express their intention to quit smoking, there may be barriers or challenges that create a gap between intentions to quit and actual quitting behavior. Health concerns were identified as the most motivating reason for attempting to quit smoking among university students (Asfar, Ward, Eissenberg & Maziak, 2005).

## CONCLUSIONS

Medical students have a significantly higher level of knowledge in various aspects related to WPS compared to non-medical students. Various factors attributed to WPS practicing such as cafés or restaurants and influence from friends. Non-medical students also exhibit higher rates of weekly base use of WPS compared to non-medical students. The majority of students, regardless of their medical background, perceive WPS as more socially acceptable than cigarette smoking. They believe that smoking WP induces a sense of relaxation and view it as an effective strategy for coping with stress. However, there are no significant differences in attitudes towards WPS between medical and non-medical students.

## DECLARATION SECTION

### Availability of data and material

Data is available at the request of the corresponding author.

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