

RESEARCH ARTICLE

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The Prevalence of Water Pipe Smoking and Perceptions on its Addiction among University Students in Palestine, Jordan, and Turkey

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Abstract

Background: Understanding the university students' perception of Water Pipe smoking addictions and factors behind the rise in the prevalence of Water Pipe smoking will contribute effectively in the prevention strategies and policies development. **Aims:** Thus, this study aims to assess the prevalence of Water Pipe smoking among university students and their perceptions on its addiction in Palestine, Jordan, and Turkey, as an initial step to reduce the spread of Water Pipe smoking. **Methods:** An online self-structured questionnaire was administered to 2030 selected university students from Palestine, Jordan, and Turkey. Prevalence, knowledge and other related factors concerning Water Pipe smoking and its addiction were compared between university students from three Middle East countries (Palestine, Jordan, and Turkey) using SPSS software for statistical analysis. **Results:** The overall prevalence of Water Pipe smoking was 31.8%, less than a quarter of university students (21.7%) had ever smoked Water Pipe. The highest percentage of current Water Pipe smokers were Palestinians (36.11%), and the lowest percentage was from Turkey (20.23%). Approximately 43% of Water Pipe smokers believe that they will be addicted to Water Pipe smoking and almost half of them smoke Water Pipe daily. The highest percentage of smokers were university students 25 years old and above. However, the highest percentage of smokers was low monthly income students. The university students living with their families were smoking Water Pipe less frequently than students living in private residencies. **Conclusions:** The prevalence of Water Pipe smoking among university students in Palestine and Jordan was high compared to Turkey. It was believed that the Turkish rules and regulations of Water Pipe smoking limit the Water Pipe smoking in Turkey.

Keywords: Water Pipe- addiction- prevalence- Palestine- Jordan- Turkey

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Introduction

Water Pipe has several universal components, including a water bowl, metal body, head with holes in the bottom, and flexible hose with a mouthpiece. The device works by burning charcoal that then burns a tobacco mixture, as well as heats the water. Smoking of the charcoal helps move the tobacco through the water and hose and up to the mouthpiece (Qasim et al., 2019). Water Pipe smoking is a centuries-old tradition that has been practiced for approximately 400 years. The global epidemiological gradient of Water Pipe smoking has risen to an alarming rate in the last two decades (Alanazi, 2019; Tucktuck et al., 2017).

Currently, Water Pipe smoking gains global popularity among various classes and groups of communities worldwide (Lee et al., 2020; Maziak et al., 2015). But, it

focused more towards youth and university students due to multiple reasons such as the social acceptability of Water Pipe smoking, the role of Internet and social media, limited specific rules and regulation toward tobacco smoking in general and Water Pipe smoking in particular, different acceptable and tasty flavors of Muassel, and culture ties (Abu-Rmeileh et al., 2018), considering that the world has become open to each other.

In general, tobacco smoking is one of the main behavioural factors related to increased risk of heart diseases and cancer, which are the leading causes of death globally (Hawash and Baytas, 2018). Particularly, multiple systems might be affected by Water Pipe smoking, both by direct contact with the Water Pipe or by smoke inhalation. Water Pipe smoking causes negative health consequences, which are unaware, neglected, or treated with lack of seriousness among its various smokers (Atwa et al., 2019).

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They are inclusive of periodontal disease, respiratory illness, low birth-weight (Aljadani et al., 2020), elevation of total plasma lipids (Bhatnagar et al., 2019), and heart diseases such as blood pressure, tachycardia, and deterioration of right ventricular function (Alarabi et al., 2020). It was reported that Water Pipe smokers have a significant decrease in lung function parameters (Nazzal et al., 2020). Furthermore, Multiple cancer types have been related to Water Pipe smoking, such as keratoacanthoma and lung cancer (Szyfter et al., 2019). Water Pipe smoking is highly prevalent in developing countries, especially in the Eastern Mediterranean countries (Hamadeh et al., 2020; Salloum et al., 2019). Smoking of Water Pipe is also known as smoking Narghile, Hookah, Goza, and Hubble bubble, in addition to being a popular scourge and social habit, especially among adolescents (Jafaralilou et al., 2021; Muzammil et al., 2019).

It has been claimed that more than 100 million people smoke Water Pipe (Al-Sawalha et al., 2021). Water Pipe smokers are convinced that the toxins and heavy metals in the smoke are removed by the water in the pipe. Therefore, it is less harmful than cigarette smoking and non-addictive (Darawshy et al., 2021). However, Water Pipe smokers might inhale more smoke than cigarette smokers due to the longer duration of Water Pipe smoking. In addition, one session of Water Pipe smoking is found to be equivalent to smoking 100 cigarettes (Adetona et al., 2021). High concentrations of nicotine, tar, carbon monoxide, and heavy metals are present in the Water Pipe smoke (Taati et al., 2020). Water Pipe's country of origin is thought to be India, but others have stated that it is Ethiopia, South Africa, or Persia (Amere et al., 2018).

Reviewing many published studies concerning the prevalence of Water Pipe smoking conducted in various countries (Pakistan, Rwanda, Saudi Arabia, and Palestine), it is clear that the highest concentration of smokers was among the adolescent age group. Within these ages, the prevalence of Water Pipe smoking has been reported as 19.7%, 21%, 12.6%, and 30–36% in Pakistan, Rwanda, Saudi Arabia, and Palestine, respectively (Amere et al., 2018). Compared to cigarette smoking, one study observed that Water Pipe smoking is more addictive and more socially acceptable (Babaie et al., 2021). It is also noticeable that the total prevalence rate of Water Pipe smoking in Turkey was found to be 32.7% in general, 28.6%, and 37.5% among medical and non-medical university students in particular, respectively, as confirmed by a study conducted in the year 2010.

Furthermore, the preferred smoking method among female university students was Water Pipe only, with a percentage that constitutes more than half of the survey sample indicated they are smokers (i.e. 53%) (Jabra et al., 2021). In addition, the prevalence rate of Water Pipe smoking among university students in Palestine was reported to be high (24.4%), and surpassed the prevalence rate of cigarette smoking (18.0%) (Tucktuck et al., 2017). Consequently, an important indicator of the high rate of Water Pipe smoking in three main Middle Eastern countries in general, and its university students in particular were taken into account when conducting this study.

As reported by the World Health Organization (WHO) tobacco control papers, some countries have regulations to limit and restrict the Water Pipe smoking. In Turkey, a warning labeling must cover 65% of Water Pipe bottles; this warns Water Pipe smokers about the hazards of Water Pipe smoking (Kienhuis and Talhout, 2020; Regulation, 2015). Therefore, several studies have been conducted to investigate tobacco smoking in general and Water Pipe in Pipe among university students in the Middle East. Consequently, the Water Pipe smoking and its ubiquitous practice among adolescents and young adults prompt worrisome health outcomes in the future, and could prelude to an emerging new strain global tobacco epidemic and bearing additional burdens by health care systems.

Given the current gaps in the literature, the necessity to understand the epidemiology of Water Pipe smoking and the WHO's recommendation to strengthen its surveillance and monitoring among various groups, and due to the many harmful effects, this study focused on assessing prevalence of Water Pipe smoking and perception on its addiction among university students in three Middle East countries (Palestine, Jordan, and Turkey) through questions addressing Water Pipe smoking frequency and addiction. These countries differ by culture, race demographics, the educational level of the students and parents, age, income, and residency status. However, given the variation in Water Pipe smoking regulation among these countries, we attempted to test for a relationship between these regulations (presence and absence) and the prevalence of Water Pipe smoking.

Materials and Methods

Research design, setting, and population

An online cross-sectional study was carried out among university students from three Middle Eastern countries (Palestine, Jordan, and Turkey). The criteria to participate in the study were being a university student in Turkey, Jordan and Palestine resident, knowing Arabic, or Turkish or English, having internet access, and voluntary participation. A total of 2030 students were selected for the study. The data concerning the prevalence of Water Pipe smoking and the associated factors were collected from university students. The universities agreed to be included mainly in the study among others are An-Najah National University-Nablus, Palestine, Al-Zaytoonah University of Jordan-Amman, Jordan, and Girne American University, Kyrenia-North Cyprus-Turkey.

An-Najah National University is the largest Palestinian university, with 300 professors and 23,345 enrolled students in 19 faculties (Sweileh et al., 2014); Al-Zaytoonah University of Jordan is a private Jordanian university with 8,000 enrolled students, of which 14% are international students representing 28 countries (Al-Qerem et al., 2019); The Girne American University was the first private university in North Cyprus, with 18,000 students according to 2016 statistics (Al-Qerem et al., 2019; Girne (GAU), 2021). The total population size was 49,345 students.

Participants were recruited by electronic post of an online questionnaire including a web link to the

questionnaire page in a Google Form via email or public social media pages and applications (e.g. Facebook, WhatsApp, etc.). The participants could answer the electronic questions, then click submit which re-upload the answers in the same electronic form back to the researchers. This type of form has been used in other studies to gather answers online (Jarrar et al., 2019). The process of contacting the students was facilitated using official Facebook pages of student associations and unions, and emails to invite them to participate in the study and take part in a survey and provided survey URL to access the online copy of the study questionnaire formulated using Google forms system.

Ethical consideration

The study was approved by the Institutional Review Board (Ref. No. IRB: 17.06.2019) at the Faculty of Medicine and Health Sciences of An-Najah National University, and was performed in compliance with the Helsinki Declaration for research in humans. The researchers obtained informed consent from students who agreed to participate on the study upon distribution of the online questionnaire. The students were informed about the study objectives and outcomes prior to allowing them to fill out the online questionnaire. They were assured that the collected data would be kept confidential and would be used for research purposes only, and that participation was voluntary. Subsequently, the students should click in text "I have read and agreed to the terms and conditions", and in "Yes" in the Add answer option box "Do you wish to participate?" Furthermore, the study considered the maximum privacy level and that the students could refuse to participate in the study.

Sample size calculation and sampling technique

All enrolled, full time, undergraduate, and postgraduate students at the selected universities were comprised in the sampling frame. The Raosoft Sample Size Calculator (www.raosoft.com) was used to calculate the minimum sample size. The sample size calculation was based on the total enrolled students at the participating universities (Sturgeon et al., 2019). Therefore, the counted population size for the participating universities ($n = 49,345$) included the total number of enrolled students in An-Najah National University (up to 23,345 enrolled students), Al-Zaytoonah University of Jordan (up to 8,000 enrolled students), and Girne American University (up to 18,000 enrolled students).

The estimated minimum sample size for a 95% confidence level and margin error of 5% was 1122 university students. Whereas Palestine, represented by An-Najah National University, had the largest minimum sample size ($n = 378$), followed by Turkey, represented by Girne American University ($n = 377$; 36%), and Jordan, represented by Al-Zaytoonah University of Jordan ($n = 367$). Subsequently, a total minimum sample size of $n = 416$ from Palestine, $n = 414$ from Turkey, and $n = 403$ from Jordan with a total minimum sample size of $n = 1233$ for the study were requested to account for a non-response of 10% for each country to overcome non-response bias and to meet the research objective of the study.

A stratified random sampling method was used (Ilyasu

and Etikan, 2021); the students were stratified into three different universities from three different Middle East countries, then into schools or faculties, and finally into departments. The students were chosen using a student list made available by each department on request. Subsequently, random selection was made using the Statistical Package for Social Sciences (SPSS) version 20. Students were approached in lecture rooms before or after a class. The questionnaires were distributed online to the selected students. Consequently, student participation was based on their self-selection and their willingness to accept study participation. The absent students were replaced by running the SPSS again to provide an opportunity to maintain random selection of the students and achieve the required sample size.

Data collection

The researchers invited all male and female students from participating universities to participate in the study. A self-administered questionnaire was distributed online. The questionnaire was the sum of questions extracted from various questionnaires used in previous studies (Jarrar et al., 2019; Joveini et al., 2016). Therefore, the final questionnaire was based on similar questionnaires used in previous similar studies, which were modified to match the data required to meet the study objectives. The questionnaire had been translated to Arabic (i.e., the local language for Palestine and Jordan) and Turkish (the local language for Turkey) languages for better interpretation by the selected students and validated for both languages. The validity was established by conducting a pilot study. The final questionnaire was tested in a pilot, web-based study, among students of the participating universities but not enrolled in the study.

This study collected data concerning socio-demographic and economic characteristics of the study participants, the affiliated university, and the prevalence and patterns of Water Pipe smoking, and attitude towards Water Pipe addiction (Mosleh et al., 2017; Omotehinwa et al., 2018). The subsequent analyses focused mostly on the responses to the questions concerning Water Pipe smoking status "Have you ever smoked Water Pipe" and/or "Are you currently smoking Water Pipe", and/or "Do you currently smoke Water Pipe daily or less than daily".

"Has ever smoked Water Pipe" was defined as the participants had smoked Water Pipe, even one or two puffs, at any time before the study. A current Water Pipe smoker was defined as those who had smoked Water Pipe at least once during the past 30 days. Daily means smoking Water Pipe at least once every day or nearly every day during the past 30 days or more (Othman et al., 2019). The researchers carried out the survey during the period from July to September 2019. The study participants completed the self-administered questionnaire and submitted it online to the supervisor of the data collection. Completing the questionnaire took an average of 2 to 3 min.

Data analysis

Before starting the data analysis process (pre-analysis phase), data were coded to maintain the participants' privacy and confidentiality. Next, data were organized and

analysed using the SPSS program version 20. Descriptive and comparative analyses were carried out for all variables, which were expressed as frequency and percentage for categorical variables. The Chi-square test was used to establish relationships between the independent variables and the dependent variables. Binary logistic regression was used to assess statistical significance of the difference in the prevalence of Water Pipe use, which includes total prevalence of Water Pipe smokers, prevalence of current Water Pipe smokers (i.e. daily or less than daily), and prevalence of those who never/ever smoked Water Pipe according to independent variables.

Results

General characteristics of the sample

A total of 2,030 responses to the online questionnaire were received. One-thousand and eighty (53.2%) responses were originally from An-Najah National University-Palestine; 497 (24.5%) responses were from Al-Zaytoonah University of Jordan-Jordan, and 453 (22.3%) responses were from Girne American University-Turkey. Most responses were received from An-Najah National University (n = 1080 followed by Al-Zaytoonah University of Jordan students (n = 497, and students from Girne American University in North Cyprus (n = 453). Various characteristics of the participating students are listed in Table 1.

Prevalence and patterns of Water Pipe smoking

The result shows as in Figure 1 more than quarter (n = 645, 31.8%) of the participating students were current Water Pipe smokers, less than quarter (n = 440, 21.7%) reported ever smoking Water Pipe, and less than half of them (n = 945, 46.5%) had never smoked Water Pipe. For each country, the current, ever, and never proportions are summarised in Figure 1. Palestinian students reported the highest rate of current Water Pipe smokers (n = 438, 40.5%), followed by Jordanian (22.7%) and Turkish

(20.3%) students.

Figure 1 shows the total prevalence of Water Pipe

Table 1. Socio-Demographic Characteristics of Participating Students

Variable / Category	Frequency (N=2030)	Percentage (%)
Age		
Less than 23	1670	82.26
23 and More	360	17.74
Sex		
Male	963	47.4
Female	1067	52.6
Monthly income		
Less than 1000 \$	1023	50.4
1000 \$ and more	1007	49.6
Country		
Palestine	1080	53.2
Jordan	497	24.5
Turkey	453	22.3
Faculty		
Medical Sciences	1163	57.3
Sciences	55	2.7
Engineering	177	8.7
Educational & social sciences	125	6.2
Others	510	25.1
Level of study		
First year – Third year	1028	50.6
Fourth year- Sixth year	872	43
Master & PhD	130	6.4
Current Residency		
With the family	1335	65.8
Private students' dormitory	485	23.9
Government students' dormitory	43	2.1
Other	167	8.3

Table 2. Water Pipe Smoking Habits and Self-Reported Addiction among Participating Students

		Country			P value	
		Palestine	Jordan	Turkey	Total	0
Water Pipe Smoking Frequency	Minimum once a day	47.30%	65.90%	14.70%	48.40%	
	Minimum once a week	34.10%	4.90%	14.70%	25.40%	
	Minimum once a month	17.40%	26.80%	44.10%	21.50%	
	Not sure	1.20%	2.40%	26.50%	4.70%	
Total		100%	100%	100%	100%	
Lifetime Water Pipe Smoking	During study	7.90%	12.20%	5.90%	9.10%	0.033
	During a meeting with friends	64.60%	46.30%	50.00%	58.10%	
	During social meetings	15.90%	36.60%	23.50%	20.90%	
	Other	11.60%	4.90%	20.60%	11.90%	
Total		100.00%	100.00%	100.00%	100.00%	
Perception on Addiction to Water Pipe Smoking	Yes addictive	44.20%	58.50%	17.60%	42.90%	0.006
	Non addictive	40.00%	34.10%	58.80%	42.10%	
	Maybe addictive	15.80%	7.30%	23.50%	15.00%	
Total		100.00%	100.00%	100.00%	100.00%	

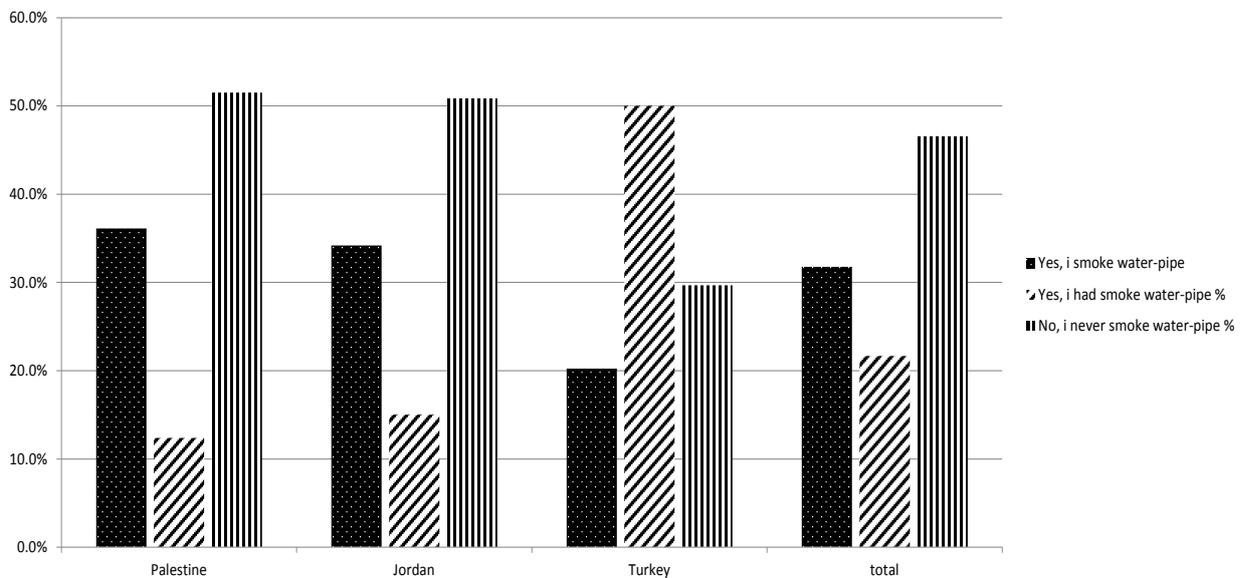


Figure 1. Prevalence of Water Pipe Smoking among Palestinian, Jordanian, and Turkish Students

Table 3. Household Monthly Income Versus Prevalence among Current, Ever, and Never Smoking Water Pipe

Household Monthly Income	Water Pipe Smoking			Total	% of Current Smokers	P-value
	Yes, currently smoke Water Pipe	Yes, had smoked Water Pipe	No, never smoked Water Pipe			
Less than 1000 \$	313	228	483	1,023	65.60%	0.083
1000\$, and more	332	212	462	1,007	63.70%	
Total	645	440	945	2,030		

smokers and the prevalence of current, ever, and never smokers among Palestinian, Jordanian, and Turkish students. Table 2 showed that 48.4% of the participants were smoke Water Pipe minimum once a day, 25.4% of the participants were smoke Water Pipe minimum once a week, and 21.5% smoked minimum smoked Water Pipe once a month. However, Table 2 also shows frequency of smoking water-pipe and the smoking time during studying or meetings, related to each country, as well as the believing to become addict to Water Pipe smoking.

Table 3 shows that the current smokers who had monthly income less than 1,000\$ 1,023 students 65.60%, and who had 1,000\$ and more 1007 students 63.70%. The result indicates no significant between the participants according to monthly income. Table 4 shows the number

of medical sciences smoker Water Pipe is 345 (29.66%), from faculty of sciences is 18 (31.80%), from faculty of Engineering is 70 (39.43%).

Table 5 shows that the total number of participants who current smoke Water Pipe according to the level of study is 646 (31.77%). The level of first- third year participants number of current smoke Water Pipe is 315 (30.64%), fourth- sixth year is 273 (31.30%), and master PhD participants is 57 (43.84%).

Table 6 shows the number of current smoker Water Pipe with their family is 413 (30.90%), in private dormitory are 170 (35.10%), and in the government dormitory is 13 (30.10%). The result shows that no significant between the participants according the current residency. Table 7 shows that significant result indicates that the current smokers of

Table 4. Proportion of Students within Different Faculties, Versus Prevalence among Current, Ever, and Never Smoke Water Pipe

Faculty	Water Pipe Smoking			Total	% of Current Smokers	P value
	Yes, currently smoke Water Pipe	Yes, had smoked Water Pipe	No, never smoked Water Pipe			
Medical Sciences	345	180	638	1,163	29.66%	0.001
Sciences	18	0	37	55	31.80%	
Engineering	70	58	50	177	39.43%	
Educational Social	37	27	60	125	30.00%	
Another of Faculties	175	175	160	510	34.31%	
Total	645	440	945	2,030		

Table 5. Level of Study Versus Prevalence among Current, Ever, and Never Smoke Water Pipe

		Water Pipe Smoking			Total	% of Current Smokers	P value
		Yes, currently smoke Water Pipe	Yes, had smoked Water Pipe	No, never smoked Water Pipe			
Level of Study	First - Third Year	315	228	485	1028	30.64%	0.502
	Fourth - Sixth Year	273	195	404	872	31.30%	
	Master+ PhD	57	17	56	130	43.84%	
Total		645	440	945	2030	31.77%	

Table 6. Current Residency Versus Prevalence among Current, Ever, and Never Smoke Water Pipe

		Water Pipe Smoking			Total	% of Current Smokers	P value
		Yes, currently smoke Water Pipe	Yes, had smoked Water Pipe	No, never smoked Water Pipe			
Current Residency	With my family	413	252	670	1335	30.90%	0.183
	Private Dormitory	170	103	212	485	35.10%	
	Government Dormitory	13	15	15	42	30.10%	
	Other	50	70	48	167	29.94%	
Total		258	176	378	2030		

Water Pipe are males 45.06% (434/963).

Discussion

This study provides a general idea about the differences in the prevalence of Water Pipe smoking among university students from Palestine, Jordan, and Turkey. We detected a high prevalence of Water Pipe smoking among university students, and the highest prevalence was in Palestine. There are several recent studies with available data concerning the prevalence of Water Pipe smoking and health effects in the Middle East. They have indicated an increase in the prevalence of Water Pipe smoking in the Middle East countries (Bashirian et al., 2021; Jawad et al., 2018; Nasser et al., 2020). Thus, these results indicated the need for a health warning among university students concerning the harmful health effects of Water Pipe smoking.

The water in Water Pipe does not filter these components (Qasim et al., 2019). Nicotine is a mood-altering ingredient of Water Pipe that reaches the brain of the Water Pipe smokers in mere seconds and makes them feel recognized for a while. However, they become crave and tired after that effect disappears (Al-Shatnawi et al., 2021). Furthermore, Water Pipe smokers are exposed to substances that can damage their lungs. Thus, Water Pipe smokers are at higher risk for chronic obstructive

and restrictive lung diseases, such as lung cancer, chronic obstructive pulmonary diseases (COPD), and emphysema (Patil et al., 2019).

Forced Expiratory Volume in 1 second (FEV1), Forced Vital Capacity (FVC), and FEV1/FVC Ratio are essential parameters for the diagnosis of obstructive and restrictive pulmonary diseases. Water Pipe smoking results in a significant reduction in FEV1, FVC, and FEV1/FVC ratio (Adetona et al., 2021). Furthermore, Water Pipe smoking increases the probability of developing gastric cancer, even though the mechanism is still unknown. Also, Water Pipe smokers are exposed to decreased production of saliva, which is a natural cleanser of the mouth. So, the Water Pipe smoker's mouth is dry, and more susceptible to cavities and at higher risk for tooth decay and bad breath. The more a person smokes Water Pipe, the worse their breath will smell. An alteration in oral microbial flora was also documented among Water Pipe smokers (Meo et al., 2014; Patil et al., 2019). Subsequently, the increase in the prevalence of Water Pipe smoking among university students in Palestine and Jordan is an epidemic, which requires efforts to increase awareness of the harmful effects of Water Pipe smoking among students.

The Global Youth Tobacco Survey Collaborative Group estimated that 10 to 18% of adolescents aged from 13 to 15 years use tobacco products other than cigarettes, mostly in the Eastern Mediterranean region (AlMulla et

Table 7. Gender, Country Versus Prevalence among Current, Ever, and Never Smoke Water Pipe

		Yes, currently smoke Water Pipe	Yes, had smoked Water Pipe	No, never smoked Water Pipe	Total	% of Current Smokers	P value
Palestine	Male	272	92	148	512	53.12%	0
	Female	134	47	387	568	23.59%	
Jordan	Male	111	40	85	236	47%	
	Female	62	33	143	261	26%	
Turkey	Male	51	116	48	215	23.89%	
	Female	31	99	108	238	12.72%	

al., 2021; Ma et al., 2021). The high prevalence of Water Pipe smoking among the Al-Zaytoonah University of Jordan deserves attention. Particularly, the students' composition of the Al-Zaytoonah University of Jordan consists of Jordanian students and a certain percentage of students from Arab countries with a high prevalence of Water Pipe smoking, such as Iraq, Palestine, and Arab Gulf countries. This confirms what was stated by study in Palestine (Zabadi et al., 2018) that the health care professionals can be considered as a role models for cigarettes and Water Pipe smoking control, and academics can benefit from its results to be considered as role models for their students and the community in fighting Water Pipe smoking and promoting smoking cessation through health awareness educational activities, including lectures, workshops, and conferences.

The study results concerning the differences of distribution of Water Pipe smoking among different faculties showed that there are several potential explanations for the high prevalence of Water Pipe smoking among students from faculties of Engineering, followed by students from the faculties of medical sciences. The high stress, the limited awareness that Water Pipe smoking can relieve stress, and the popular belief that Water Pipe smoking is less toxic than cigarettes were the main factors accounting for the relationship between the difficulty of the specialisation field and increasing prevalence of smoking in general and Water Pipe smoking in particular (Arshad et al., 2019; Zabadi et al., 2018). However, the majority of the students of medical faculties were knowledgeable about the harmful effects of Water Pipe smoking because of their educational courses.

But, Water Pipe smoker students had less knowledge than Water Pipe non-smoker students, with a statistically significant difference ($p < 0.05$) regarding knowledge of smoking as a harmful effect on their health, and risk factor of heart diseases, cancer, pulmonary diseases, mental conditions, and addiction (Lee et al., 2020; Muzammil et al., 2019). So, Water Pipe smoker students did not take what they learned from the courses seriously to quit Water Pipe smoking and develop their own health (El Amin, 2019). Other factors, such as curiosity and social trends, are the main reasons for Water Pipe smoking (Othman et al., 2019). However, the low exposure to education related to Water Pipe hazards and cessation in medical school or postgraduate training is probably the main contributing factor for the high frequency of Water Pipe smoking among university students.

The study results show that the study level and current residency were not significantly associated with the prevalence of Water Pipe smoking among university students. However, this study might draw attention to important points, especially that all study variables are interrelated with others. Most university students started Water Pipe smoking at ages below 24 years old, and the proportion increases with age and level of study. Thus, the adolescence which in parallel with the university life, distance from parents, and lifestyle changes might have psychological and physiological effects that lead to increased prevalence of Water Pipe smoking among university students. Subsequently, there is a need to

improve dominant educational style that focuses on the curriculum offered without drawing the attention of academics to the need to get closer to the students and their lifestyles during their high school and university life at a sensitive age (Sáenz-Lussagnet et al., 2021).

Also, Water Pipe smoking is more prevalent among university students due to severe stress, very busy schedules, the lifestyle of university hostiles, friendships between students and distance from parents, and increasing responsibilities (Veeranki et al., 2015). Thus, this explains the highest percentage of Water Pipe smokers among Master's students and those living in private hostiles surrounding the universities. There is a social stigma associated with Water Pipe smoking (AlQahtani, 2017). Therefore, the study results in comparison with others which were in favour of Turkey had shown that the culture of the Turkish community concerning Turkish students' lifestyle is full of study and provision of work opportunities during the university life to fill their leisure time and keep them away from all health risks caused.

Furthermore, Turkey might implement strategies of medical schools and residency training programs that have additional benefits of reducing the prevalence of Water Pipe smoking in the general population (Eissenberg, 2019). Water Pipe smoking has almost the same health risks as cigarette smoking because Water Pipe smoke also requires charcoal to be burnt, which interacts with tobacco, creating fumes that can be just as toxic as cigarette smoke. The Water Pipe smoker still receives nicotine, which is a highly addictive substance (Al-Jayyousi et al., 2021). However, Water Pipe smoking might be more toxic than cigarette smoking. People who smoke Water Pipe might be exposed to the toxins in the smoke longer than if they smoked cigarettes.

They may take 200 puffs during a 1 hour-long Water Pipe session, which is equal to 10-times what a person puffs on a cigarette (an average of 20 times). Furthermore, the amount of nicotine delivered through Water Pipe smoking is more than 2.5-times the amount of nicotine delivered to cigarette smoking (Bhatnagar et al., 2019). However, the lack of Water Pipe smoking among some university students does not necessarily mean that those students do not smoke cigarettes (Lipkus and Mays, 2018). Nevertheless, the health risks associated with Water Pipe smoking and research in the Middle East prompted us to carry out this study.

The current study is the first to provide a comparison of the prevalence of Water Pipe smoking and associated factors among university students in the Middle East. Thus, the study results could provide a baseline for future studies in Middle Eastern countries. This study is the first to utilize the core factors related to Water Pipe smoking among university students in three different Middle East countries, and these findings will be useful for making future local and regional comparisons. Also, the study included university students from distinguished universities and belonging to an age group in need of care, attention, and awareness (Abu-Rmeileh et al., 2017).

However, the study did not provide information concerning the prevalence of Water Pipe smoking relative to cigarette smoking, marking Water Pipe smoking

among university students as a potential public health concern in the Middle East and completely neglected to mention cigarette smoking. Furthermore, the study is cross-sectional; this in itself is considered as a limitation of the study. The cross-sectional design is not intended for generalisations, and hindered any attempt to make causal associations between independent and dependent variables. Also, any future study will require more public and private universities to achieve a representative sample from the university student population, so that the results can be generalised in Palestine, Jordan, and Turkey.

In conclusion, there was a high prevalence of Water Pipe smoking among university students in the Arabian countries (especially Palestine) relative to Turkey. Different factors affect the prevalence of Water Pipe smoking, including age, monthly income, residency, and level of education. A high percentage of smokers reported the belief that they are addicted to Water Pipe smoking. The majority of current Water Pipe smokers were smoking Water Pipe daily, especially in Jordan and followed by Palestine. Based on these findings, we believe that the regulation of Water Pipe smoking in Turkey limits the prevalence of Water Pipe smoking. Therefore, we recommend that the health ministries in Palestine and Jordan should establish regulations and restrictions for Water Pipe smoking, especially among adolescents.

Abbreviations

SPSS: Statistical Package for Social Sciences, n: number of students, IRB: Institutional Review Board.

Author Contribution Statement

The contributions of the authors were as follows: Mohammed Hawash: Conception of the work, study design, analysis and interpretation, drafted, written, and substantially revised the article, agreed on the journal to which the article will be submitted, and agree to take responsibility and be accountable for the contents of the article. Reviewed and agreed on all versions of the article before submission, during revision, the final version accepted for publication, and any significant changes introduced at the proofing stage.

Rami Mosleh: Made a significant contribution to the work conception and analysis and interpretation. Have drafted, written, and substantially revised and critically reviewed the article. Have agreed on the journal to which the article will be submitted. Reviewed and agreed on all versions of the article before submission, during revision, the final version accepted for publication, and any significant changes introduced at the proofing stage. Agree to take responsibility and be accountable for the contents of the article.

Yazun Jarrar: Execution, acquisition of data, analysis and interpretation. Have drafted, and critically reviewed the article. Have agreed on the journal to which the article will be submitted. Reviewed and agreed on all versions of the article before submission, during revision, the final version accepted for publication, and any significant changes introduced at the proofing stage. Agree to take responsibility and be accountable for the contents of the

article.

Ahmad Hanani: Execution, acquisition of data, analysis and interpretation. Have drafted, written, and critically reviewed the article. Have agreed on the journal to which the article will be submitted. Reviewed and agreed on all versions of the article before submission, during revision, the final version accepted for publication, and any significant changes introduced at the proofing stage. Agree to take responsibility and be accountable for the contents of the article.

Yousef Haj Yousef: Conception of the work and analysis and interpretation of the data. Have agreed on the journal to which the article will be submitted. Reviewed and agreed on all versions of the article before submission, during revision, the final version accepted for publication, and any significant changes introduced at the proofing stage. Agree to take responsibility and be accountable for the contents of the article.

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Ethics approval and Consent to Participate

We declare that all authors approve the submission of the manuscript to this journal. The authors own the copyright for the entire manuscript, including all artwork and tables. The Institutional Review Board approved the study at the Faculty of Medicine and Health Sciences of An-Najah National University (Ref. No. IRB: 17.06.2019). Before the students responded to the online questionnaire, they received an attached letter that explained the purpose of the research, that the data would only be used for research purposes by the researcher, and included the phrase "If they would like to answer, they can open the questionnaire and response, and if not, they can skip it".

Consent to publish

Not applicable.

Availability of data and materials

The datasets used during the current study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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