

# A Comparison of Shisha Smoking among University students in Palestine, Jordan and Turkey

**Mohammed Hawash** (✉ [mohawash@najah.edu](mailto:mohawash@najah.edu))

An-najah National University Faculty of Medicine and Health Sciences <https://orcid.org/0000-0001-5640-9700>

**Rami Mosleh**

An-najah National University Faculty of Medicine and Health Sciences

**Ahmad Hanani**

An-najah National University Faculty of Medicine and Health Sciences

**Yazun Jarar**

Al-Zaytoonah Private University of Jordan Faculty of Pharmacy

**Yousef Hajyousef**

Cyprus International university

---

## Research article

**Keywords:** Shisha, Smoking, Cancer, Addiction, Prevalence, Palestine, Jordan, Turkey

**Posted Date:** December 13th, 2019

**DOI:** <https://doi.org/10.21203/rs.2.18834/v1>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

---

## Abstract

**Background:** Smoking is one of the main causes that is related to lung cancer. It was estimated that tobacco smoking may kill 10 million people annually in the next 20–30 years, and Shisha smoking was very common habit worldwide during the last 20 years, especially in the Middle East. This study aimed to determine the prevalence of shisha smoking and make a comparison between three different countries in the Middle East, and establishing factors associated with shisha smoking among students in universities in Palestine, Jordan and Turkey.

**Methods:** An online cross-sectional study was carried out among university students from 3 different Middle East countries; Palestine, Jordan, and Turkey. A total of 812 students were selected for the study. They were asked to answer an online structured questionnaire consisted of questions concerning prevalence and patterns of Shisha smoking, and associated factors. Data was analyzed by Statistical Package for Social Sciences.

**Results:** The overall prevalence of Shisha smoking was 31.77%. Less than quarter of university students (21.67%) had smoked shisha before. The highest percentage of current Shisha smokers were Palestinians (36.11%), and lowest percentage was from Turkey (20.23%). Approximately 43% of Shisha smokers believe that they will be addicted to Shisha smoking and almost half of them smoke Shisha daily. Approximately, 66% of Jordanian students' current Shisha smokers were smoking shisha at least once daily while the 44% of Turkish students' current shisha smokers were smoking shisha once monthly. The highest percentage of Shisha smokers were university students aged 25 years old and above. However, highest percentages of university students who are Shisha smokers were low monthly income's students. The university students living with their families were smoking Shisha less frequently than students' living in private residencies.

**Conclusions:** There was a high prevalence of Shisha smoking among university students. The highest percentage of university students smoking Shisha were Palestinians. High percentage of smokers between the students believes that they will be addicted to Shisha smoking. The majority of current Shisha smokers was smoking Shisha daily; especially in Jordan and followed by Palestine. The monthly income was affecting the prevalence of Shisha smoking.

## Background

The tobacco smoking is one of the main behavioral factors related to increase the risk of cancer worldwide, which is one of the leading causes of death globally so far [1]. Shisha smoking with different names water pipe, Narghile or Hookah is one of the main social habits and behaviors which is becoming more common day by day especially among adolescents. It was claimed that more than one hundred millions of people worldwide smoke shisha [2]. Smoking Shisha is less harmful than cigarette; because the water is useful in the Shisha to purify the toxins or the heavy metals. However, the Shisha smokers might inhale much more smoke as compared to cigarette smoking due to the longer duration of Shisha smoking. In addition, one session of Shisha smoking is found to be equivalent to smoking 100 cigarettes [3–5]. High concentrations of Nicotine, tar, Carbon Monoxide, and heavy metals are present in the Shisha smoke [3, 6]. The Shisha's country of origin is thought to be India, but others stated that it was Ethiopia, South Africa, or Persia [7, 8].

After reviewing many published studies concerning the prevalence of Shisha smoking; one of these studies was targeted adolescents in developing countries, with title "Knowledge, attitude and perception of water pipe smoking (Shisha) among adolescents aged 14–19 years", the targeted sample was collected in Karachi city of Pakistan. They observed that Shisha is more addictive as compared to cigarettes in the same time they were confirmed that Shisha is being more socially acceptable for that culture [2]. However, a study done in different Pakistani cities indicated that the prevalence of Shisha smoking was 19.7%, more common in males than females. Furthermore, the highest percentage of Shisha smoking was observed in Islamabad the capital of Pakistan (28.1%), and the lowest was in Peshawar (11.2%). Also, the highest percentage was observed in professional and private educational schools with almost 29% of students [5]. While the following study which is also done in Pakistan, focused on the frequency of Shisha smoking found that 36% of students

were smoking shisha in different frequencies, 45% of them were smoking Shisha rarely, 25% of smokers smoked sometimes, 13% were smoking always, 6% were smoking it often and 10% just smoked it once [9].

Data concerning Shisha use, attitude, knowledge, and factors associated with Shisha smoking was collected in a cross-sectional study conducted in Rwanda. The prevalence of the students who smoked Shisha in the last month was approximately 21%, and the students ever smoking Shisha was 26%. It was observed that the highest percentage of Shisha smokers were in ages between 20–24 years [10]. Another cross-sectional study was conducted among a sample of 371 students recruited from medical schools in eastern region of Saudi Arabia. The overall prevalence of Shisha smoking was 12.6%, more than 63% of smokers started smoking Shisha in ages between 16–18 years, and 15% of them smoked Shisha daily [11]. Another study titled “Smoking, Awareness of Smoking Associated Health Risks, and Knowledge of National Tobacco Legislation in Gaza, Palestine” that targeted the university students in the Palestinian city of Gaza had focused on the prevalence of Cigarette and Shisha smoking, health risks, and knowledge. They observed that 55% of students ever smoked before, 36% were smoking Shisha only, and 31% were smoking cigarette [12]. A newly research conducted in Palestine from different Palestinian universities in the West Bank and Gaza Strip, had focused on the gender differences in tobacco smoking prevalence (both cigarette and Shisha), and socio-demographic characteristics. It was indicated that the overall prevalence of current tobacco smoking was 30% of the study participants, and men were more likely to be current Shisha and cigarette smokers compared to women [13].

The current study focused on the prevalence of Shisha smoking among university students in three different Middle East countries; Palestine, Jordan, and Turkey, which have different cultures and races, and associated factors such as the educational level for students and parents, age, income, and residency. Furthermore, we also tried to measure the addiction of smoking Shisha between the university students through questions concerning Shisha smoking frequency and addiction that make the study unique in comparison with other studies.

## Methods

### Research Design and Population

An online cross-sectional study was carried out among university students from 3 different Middle East countries; Palestine, Jordan, and Turkey. A total of 812 students were selected for the study, and this study was cross-sectional. The data concerning the prevalence of Shisha use and the associated factors was collected from students in different universities in Palestine, Jordan, and Turkey; which are Middle East countries. The Middle East is a transcontinental region centered on Western Asia. Geographically, the largest Middle East countries are Turkey, Egypt, and Saudi Arabia, and the smallest is Bahrain. But, Palestine, Jordan, and Turkey are pivotal in the Middle East ;due to their respective privacy [14]. Palestine is under Israeli occupation, Jordan is a fairly stable country, but it is surrounded by countries full of conflict, including Iraq, Syria and Palestine [15]. Turkey is a country that grows economically and politically, but is exposed to conspiracies. Main universities included in the study are An-Najah National University-Nablus, Palestine, Al-Zaytoonah University of Jordan-Amman, Jordan, and Girne American University, North Cyprus.

An-Najah National University is the largest Palestinian university that has 300 Professors and 23,345 enrolled students in 19 faculties posing multiple disciplines. Al-Zaytoonah University of Jordan is a private Jordanian university with 8000 enrolled students, from which 14% of them are students from 28 countries. The Girne American University was the first private university in North Cyprus, and the total number of students registered in various disciplines provided by the university was up to 18,000 according to the 2016 statistics [16, 17]. The questionnaires were formulated using Google forms and the online copy is available as a Google™ document ([https://docs.google.com/forms/d/e/1FAIpQLSdwebHFniEECLYshw2CWpSV0EDdIP9Mx1nhP4y03BdAe88D1A/viewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLSdwebHFniEECLYshw2CWpSV0EDdIP9Mx1nhP4y03BdAe88D1A/viewform?usp=sf_link) ). This type of forms were used in other studies before to collect the sample's answers online [18]. The process of contacting the students was facilitated using official Facebook pages of student's associations and unions.

## **Ethical Consideration**

The study was approved by Institutional Review Board (IRB;17.06.2019) at the Faculty of Medicine and Health Sciences of An-Najah National University, and the Ethical Research Committees of Al-Zaytoonah University of Jordan and Girne American University. Thus, the participants were students from different faculties in the universities included in the study. The questionnaires were distributed after students were informed by the researchers about the study objectives and outcomes. They were assured that the collected data would be kept confidential and would be used for the research purposes only, as well as the study participation was voluntary. Furthermore, the study took into account the maximum privacy level, and the students may refuse not to participate in the study.

## **Sample Size Calculation and Sampling Technique**

Raosoft Sample Size Calculator ([www.raosoft.com](http://www.raosoft.com)) was used to calculate the minimum sample size based on that the population size was 49,345 [19]. The counted population size included the total number of students enrolled in An-Najah National University (i.e. up to 23,345 enrolled students), Al-Zaytoonah University of Jordan (i.e. up to 8,000 enrolled students) and Girne American University (i.e. up to 18,000 enrolled students) was 49,345 enrolled students. Thus, the estimated minimum sample size for a 95% confidence level and margin error of 5% was 334 university students. Stratified random sampling method was used [20], the students were stratified into 3 different universities from 3 different Middle East countries. The students were chosen using a student's list made available by each department on request. Subsequently, random selection was done 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, Subsequently, student participation was based on their self-selection and their willingness to accept the study participation. Consequently, the absent students were replaced by running the SPSS again in order to provide an opportunity to keep random selection of the students to get the sample required for the study.

## **Data Collection**

The researchers invited all male and female students in different faculties to participate in the study. Self-administered questionnaire was distributed online. The questionnaire was the sum of questions extracted from various questionnaires used in previous studies [18, 21-23]. This study collected data concerning socio-demographic and economic characteristics of the study participants, the affiliated university, the prevalence and patterns of Shisha smoking, and attitude towards Shisha addiction [10, 24]. Subsequently, the study will be based primarily on the questions concerning Shisha smoking status "Are you smoking Shisha" and/or "have you ever smoked Shisha". A current Shisha smoker was defined as those who had smoked Shisha for at least 1 time during the past one month. The questionnaire had been translated to Arabic and Turkish languages and validated for both languages. The researchers carried out the survey during the period from July to September 2019. The study participants completed the self-administered questionnaires and submit it online to the supervisor of the data collection. Completing the questionnaire took an average of 2 to 3 minutes.

## **Data Analysis**

Before starting the data analysis process (i.e. pre-analysis phase), data were coded to maintain the participants privacy and confidentiality. Next, data were entered and analyzed using the SPSS program version 20. Descriptive and comparative statistics were carried out for all variables which were expressed as frequency and percentage for categorical variables. Chi-square test was done 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 Shisha use (i.e. total prevalence of Shisha smokers, prevalence of current Shisha smokers, and prevalence of those who never/ever smoked Shisha), and students' attitude of Shisha smoking addiction according to independent variables.

# Results

## General Characteristics of the Sample

Total 812 responses to the online questionnaire were received. Four-hundred and sixty-eight (57.6%) responses were originally from Palestine, one-hundred and sixty-eight (20.7%) responses were from Turkey, one-hundred and twenty (14.8%) responses were from Jordan and the remain responses were from other countries like Syria, Iraq and Egypt. The highest number of responses was received from An-Najah National University 258 student (35.1%) followed by Zaytoonah University of Jordan 172 students (21.2%) 147 students (18.1%) from other Palestinian universities, 115 students (14.2%) from different Turkish universities, while 66 students (8.1%) were from Girne American University in North Cyprus, and the remains student's responses come from other Jordanian Universities. Participants represented many disciplines, categorized to four main category of faculties; the majority of students were from Faculty of Medical Sciences (n = 465), Faculty of Engineering (n = 71), Faculty of Educational Social Sciences (n = 50), Faculty of Sciences (n = 22) and from other faculties (n = 204) (Table. 1).

**Table 1** Demographic Data of The Participating Students

		<b>F</b>	<b>%</b>
<b>Age</b>	17-19	88	10.8
	19- 21	321	39.5
	21-23	259	31.9
	23-25	69	8.5
	More than 25	75	9.2
	<b>Total</b>	812	100
<b>Monthly income</b>	200-500	149	18.3
	500-1000	260	32
	1000-2000	243	29.9
	More than 25	160	19.7
	<b>Total</b>	812	100
<b>Country</b>	Palestine	468	57.6
	Jordan	120	14.8
	Turkey	168	20.7
	Other	56	6.9
	<b>Total</b>	812	100
<b>University</b>	An-Najah National	285	35.1
	Alzaytoona	172	21.2
	Girne American	66	8.1
	Other Turkish	115	14.2
	Other Jordanian	27	3.3
	Other Palestinian	147	18.1
	<b>Total</b>	812	100.0
<b>Faculty</b>	Medical Sciences	465	57.3
	Sciences	22	2.7
	Engineering	71	8.7
	Educational & social sciences	50	6.2
	Other	204	25.1
	<b>Total</b>	812	100.0
<b>Level of study</b>	First year – third year	411	50.6
	Fourth year- sixth year	349	43.0
	Master degree	45	5.5
	PhD degree	7	.9

	<b>Total</b>	812	100
<b>Current Residency</b>	With the family	534	65.8
	Private students' dormitory	194	23.9
	Government students' dormitory	17	2.1
	Other	67	8.3
	<b>Total</b>	812	100

### Prevalence and patterns of Shisha smoking

Overall, 31.77% (n = 258) of the study sample were current Shisha smokers, 21.67% (n = 176) reported ever smoking Shisha and 46.55% (n = 378) never smoked Shisha (Figure1). The Palestinian students were the most current smokers of Shisha among the other nationalities and their prevalence of smoking Shisha was (n = 169, 169/468 = 36.11%) followed by Jordanian students with mean prevalence 34.17% over the total prevalence of overall students, the prevalence of shisha smokers in the Turkish students (20.23%) was the lowest between the other nationalities. While, half of Turkish students had been smoked Shisha (n = 84, 50.0%). Figure.1 shows that the Palestinian and Jordanian students has almost very close percentage of current, ever or never smoking shisha, and this might be because of very close culture, but the percentages among the Turkish students was totally different.

**Fig. 1** the total prevalence of shisha smokers, and the prevalence of current, ever, never smokers according to nationalities.

Approximately half of Shisha smokers answered that they are daily smoking Shisha Table 2. Two-thirds of current Shisha smoker Jordanian students were smoking Shisha at least once daily, and less than half of current Shisha Palestinian smokers were smoking Shisha daily, while 44% of Turkish current Shisha smokers were smoking Shisha around once monthly. Eighty five percentage of current Shisha student's smokers were smoking Shisha during the meeting with their friends Table.2. However, approximately 42% of current Shisha smokers believe that they will be addicted to shisha smoking, 58.5 % and 44.2% of Jordanian and Palestinian respectively answered "yes" they will be addicted to Shisha smoking, while 58% of Turkish students answered "no" for the same question (Table 2).

The bivariate analysis showed that the country to which student belongs to was significantly associated with shisha smoking frequency (P = 0.000), the time of smoking Shisha, and attitude concerning addiction to Shisha smoking (P = 0.006).

**Table 2** Percentage for the frequency & the event, of Shisha smoking and students opinion of Shisha addiction among different countries.

		Country				
		Palestine	Jordan	Turkey	Other country	Total
How often do you smoke Shisha?	Minimum once a day	47.3%	65.9%	14.7%	92.9%	48.4%
	Minimum once a week	34.1%	4.9%	14.7%	7.1%	25.4%
	Minimum once a month	17.4%	26.8%	44.1%		21.5%
	Not a sure	1.2%	2.4%	26.5%		4.7%
Total		100.0%	100.0%	100.0%	100.0%	100.0%
When you always smoking shisha?	During Study	7.9%	12.2%	5.9%	21.4%	9.1%
	During a meeting with friends	64.6%	46.3%	50.0%	35.7%	58.1%
	During social meetings	15.9%	36.6%	23.5%	28.6%	20.9%
	Other	11.6%	4.9%	20.6%	14.3%	11.9%
Total		100.0%	100.0%	100.0%	100.0%	100.0%
Did you believe that you could become addicted to Shisha smoking?	Yes	44.2%	58.5%	17.6%	42.9%	42.9%
	No	40.0%	34.1%	58.8%	50.0%	42.1%
	Maybe	15.8%	7.3%	23.5%	7.1%	15.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

P Value for the questions were 0.000, 0.033 & 0.006, respectively

The differences among the prevalence of Shisha smoker's students of different universities can be observed in Figure. 2. The highest percentage was among the other Palestinian universities (40.8%) and lowest percentage was in Girne American university (16.7%). However, the highest percentage of daily smoker Shisha between the students who are current smokers was in Al Zaytoona University (75.5%), and approximately 64% of current smokers in this university believe that they will be addicted to smoking Shisha (Figure.2).

**Fig. 2** the percentage differences of shisha smoker's prevalence, daily smokers, and students answered "yes".

Table 3 shows that the monthly income was considered as one of the main factors that may affect the prevalence of smoking Shisha, 260, 243, 160, and 149 of students have family monthly income between 500-1000\$, 1000-2000\$, more than 2000\$ and 200-500\$, respectively. The highest prevalence of Shisha smoking was for the students with lowest monthly income with percentage 40.93% of them were current smokers (Table.3) The prevalence of Shisha smokers according to the age differences and different country, and the total results showed that the highest percentage for the current Shisha smokers' students was an age more than 25 years old category (i.e. total 75 students 32 of them were smokers approximately 43%) (Figure 3).

**Table 3.** Family monthly income versus prevalence of current, ever and never shisha smokers.

Monthly Income	Are you smoking or smoked shisha?			Total	% of current smokers
	Yes, I smoke shisha	Yes, I had smoke shisha	No, I never smoke shisha		
200-500 \$	61	30	58	149	<b>40.93%</b>
500-1000 \$	64	61	135	260	24.61%
1000-2000 \$	91	44	108	243	37.44%
more than 2000\$	42	41	77	160	26.25%
<b>Total</b>					
258	176	378	812		

\* % of current smokers was calculated for each category individually (example  $61/149 \times 100\% = 40.93\%$ ), P Value was 0.083

**Fig. 3** the prevalence of smoking shisha in different countries (Palestine, Jordan, Turkey and other country) according to different age category (17-19, 19-21 years old etc.).

Table 4 shows that more than half of students ( $n = 465, 57.26\%$ ) were from the Medical science collages, and we can observe that their prevalence of smoking Shisha (29.67%) was lower than the mean average, while the students from the engineering collage ( $n = 71, 8.74\%$ ) have the highest prevalence of smoking Shisha (39.34%) which over the mean average, and the prevalence of smoking Shisha for the students from Faculty of Educational Social Sciences 30%, Faculty of Sciences 31.81% and from another Faculties was 34.31% (Table 4). According to the results of the bivariate analysis, the faculty to which the student affiliates was significantly associated with Shisha smoking ( $P = 0.000$ ).

**Table 4** Different Faculty versus prevalence of current, ever and never shisha smokers.

Faculty	Are you smoking or smoked shisha?			Total	% of current smokers
	Yes, i smoke shisha	Yes, i had smoke shisha	No, i never smoke shisha		
Faculty of Medical Sciences	138	72	255	465	29.67%
Faculty of Sciences	7	0	15	22	31.81%
Faculty of Engineering	28	23	20	71	39.43%
Faculty of Educational Social Sciences	15	11	24	50	30.00%
Another of Faculty	70	70	64	204	34.31%
<b>Total</b>	<b>258</b>	<b>176</b>	<b>378</b>	<b>812</b>	

\* Percentage of current smokers was calculated for each category individually (example  $138/465 \times 100\% = 29.67\%$ ), P Value was 0.000

Table 5 shows that almost half of the sample (n = 411 students) was from the students within first-third year level of study, 42.98% of students were within fourth-sixth years level of study, 5.54% were master degree students and less than 1% of students were PhD degree students (n = 7 students). We found that the majority of students were within bachelor degree, and their prevalence of smoking Shisha was very close to the mean average, while 52 students were graduated students ,master and PhD degree, and their prevalence of smoking Shisha (44.23%) was over the mean average and 23 of them were current Shisha smokers (Table.5). Approximately two-thirds of students were living with their families (n = 534) and their prevalence of smoking Shisha was very close to the mean average while the prevalence of smoking Shisha of students who leaves in Private Students' dormitory or apartments was higher than the mean average (n = 194, 35.05%). Table 5 shows that there were no significant associated between Shisha smoking and both study level (P = 0.502) and current residency (P = 0.183).

**Table 5** Level of study and current residency versus prevalence of current, ever and never shisha smokers.

		Are you smoking or smoked shisha?			Total	% of current smokers
		Yes, i smoke shisha	Yes, i had smoke shisha	No, i never smoke shisha		
Level of Study	First Year- Third Year	126	91	194	411	30.65%
	Fourth Year- Sixth Year	109	78	162	349	31.23%
	Master Degree	21	5	19	45	<b>46.66%</b>
	PhD Degree	2	2	3	7	28.57%
Current Residency	With my family	165	101	268	534	30.89%
	Private Students' Dormitory	68	41	85	194	<b>35.05%</b>
	Government Students' Dormitory	5	6	6	17	29.41%
	Other	20	28	19	67	29.85%
Total		258	176	378	812	

\* % of current smokers was calculated for each category individually (example  $68/194 \times 100\% = 35.05\%$ ), P Values were for study level (P = 0.502) and current residency (P = 0.183).

## Discussion

This study provided general idea about the differences in the prevalence of Shisha smoking in university students from 3 main Middle East countries, Palestine, Jordan, and Turkey. This research showed a high prevalence of Shisha smoking among the university students, and the highest prevalence was in Palestine. The data concerning the prevalence of Shisha

smoking in the Middle East is limited. However, a study done in Saudi Arabia showed that the prevalence rate of Shisha smoking was 37%, which was almost the same as the prevalence rate of Shisha smoking in Palestine and Jordan, and higher than the prevalence rate of Shisha smoking among university students in Turkey [25]. The prevalence of Shisha smoking among university students in Lebanon was 22.1%, 21.5% in Pakistan, and 8% among university students in the United Kingdom, respectively [26]. However, a high prevalence of Shisha smoking was also shown by other studies from the Gulf and Eastern Mediterranean countries [27], a study in Syria indicated that 25% of male university students were Shisha smokers [25].

Despite the disparity in results between different countries, but all agree that the main factors leading to the wide spread of Shisha smoking among university students globally are the provision of flavored tobacco, the thriving coffee shop, and Shisha home delivery, as well as weak roles and regulations to limit the spread of Shisha smoking [28]. Thus, 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. The highest prevalence of Shisha smoking among Al-Zaytoonah University of Jordan deserves an attention toward this scourge. Particularly, the students' composition of Al-Zaytoonah University of Jordan consists of Jordanian students and a certain percentage of students from Arab countries with high prevalence of Shisha smoking, such as Iraq, Palestine, and Arab Gulf countries. The health care professionals and academics can be considered as role models for their students and the community in fighting Shisha smoking and promoting smoking cessation through health awareness educational activities such as lectures, workshops, and conferences.

The study results concerning the differences of distribution of Shisha smoking among different faculties and showed that there are several potential explanations for the high prevalence of Shisha smoking among students from faculties of Engineering followed by students from the faculties of medical sciences. The high stress and the limited awareness that Shisha smoking can relieve stress and the popular belief that Shisha smoking is less toxic than cigarettes were the main elaboration for the relationship between the difficulty of the specialization field and increasing prevalence of Shisha smoking [29]. Subsequently, the dominant educational style in the Middle East universities that focuses on the curriculum offered without drawing attention of academics to the need to get closer to the students and their lifestyles during their university life at sensitive age.

Other factors such as curiosity and social trends are main reasons for Shisha smoking [30]. However, the low exposure to education related to Shisha hazards and cessation in medical school or postgraduate training is probably the main contributing factor for the high frequency of Shisha smoking among university students. The study results showed that study level and current residency were not significantly associated with the prevalence of Shisha 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 Shisha smoking at ages below 24 years old, and the proportion increasing 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 Shisha smoking among university students .

Shisha smoking is more prevalent among students due to severe stress, very busy schedules, the lifestyle of university hostiles, friendships between students, and distance from parents, and increasing responsibilities [31] Thus, this explains the highest percentage of Shisha smokers among Master's students and those living in private hostiles surrounding the universities. There is a social stigma associated with Shisha smoking among them [32]. Therefore, the study results in comparison with others which were in favor 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 prevalence of Shisha smoking in the general population [33].

## Conclusion

There was a high prevalence of Shisha smoking among university students in the Arabian countries in comparison with Turkey especially in Palestine. Different factors affect the prevalence of Shisha smoking like the age, monthly income, residency and level of education. High percentage of smokers between the students believes that they will be addicted to Shisha smoking. The majority of current Shisha smokers was smoking Shisha daily; especially in Jordan and followed by Palestine.

## Declarations

### Abbreviations:

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

### Ethics approval and Consent to Participate

We declare that all authors approve the submission of the manuscript to this journal. We assure in quality of authors of the manuscript that we own the copyright for the entire manuscript including all art work and tables. The study was approved by Institutional Review Board at the Faculty of Medicine and Health Sciences of An-Najah National University, and the Ethical Research Committees of Al-Zaytoonah University of Jordan and Girne American University. The date of approval is 17.06.2019. Before the students start respond to questionnaire, they received a letter that explained the purpose of the research, and the data were only used for research purpose by the researcher. "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.

### Funding

The authors received no specific funding for this study.

### Authors' contributions

MH, RM and AH conceptualized the research idea and methods. RM, YJ and YH were responsible for data collection. AH and MH analyzed the data. MH and RM wrote the manuscript, under the supervision of YJ. All authors read and approved the final draft of this manuscript.

## Acknowledgements

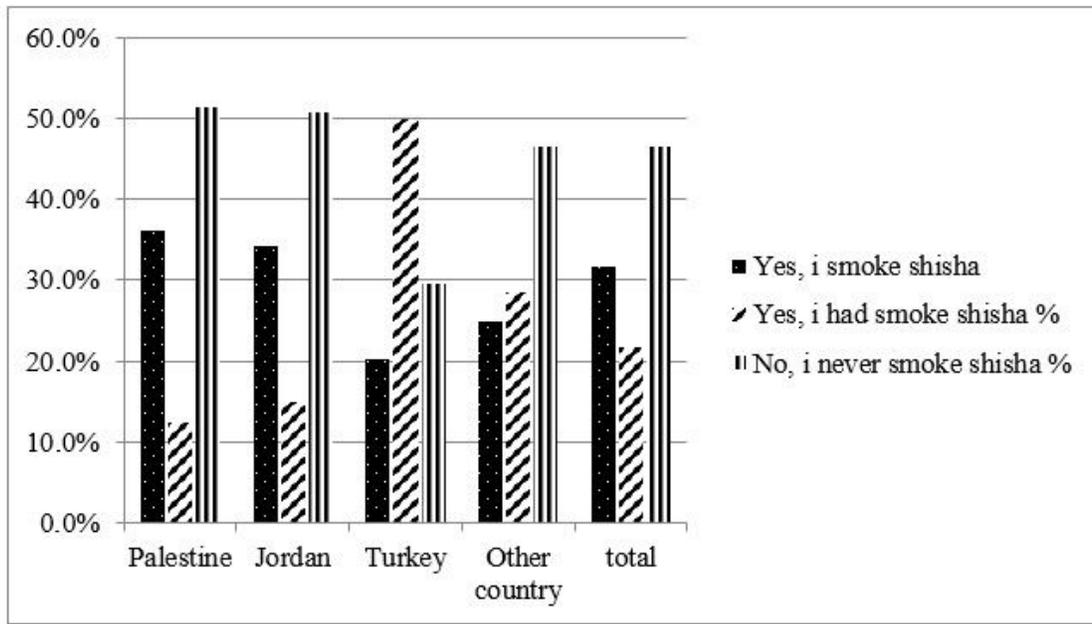
The authors highly appreciate all colleagues who helped in distribution of the online questionnaire among the universities students. We would like to thank all the universities that agreed to participate in the study, namely, An-Najah National University, Al-Zaytoonah University of Jordan, Girne American University, and Cyprus International University.

## References

1. Hawash MM, Baytas SN. Antiproliferative Activities of Some Biologically Important Scaffolds. *FABAD Journal of Pharmaceutical Sciences*. 2018;43(1):59-77.
2. Anjum Q, Ahmed F, Ashfaq T. Knowledge, attitude and perception of water pipe smoking (Shisha) among adolescents aged 14-19 years. *JPMA The Journal of the Pakistan Medical Association*. 2008;58(6):312.
3. Shafagoj YA, Mohammed FI. Levels of maximum end-expiratory carbon monoxide and certain cardiovascular parameters following hubble-bubble smoking. *Saudi medical journal*. 2002;23(8):953-8.
4. Djordjevic MV, Stellman SD, Zang E. Doses of nicotine and lung carcinogens delivered to cigarette smokers. *Journal of the National Cancer Institute*. 2000;92(2):106-11.
5. Habibullah S, Ashraf J, Javed R, Naz S, Arain GM, Akhtar T. Prevalence of Shisha smoking in college, university and Madarsa Students aged 20-25 years in Pakistan. *Pakistan Journal of Medical Research*. 2013;52(1):3.
6. Sajid KM, Akhter M, Malik GQ. Carbon monoxide fractions in cigarette and hookah (hubblebubble) smoke. *JPMA*. 1993;993:43.
7. Knishkowsky B, Amitai Y. Water-pipe (narghile) smoking: an emerging health risk behavior. *Pediatrics*. 2005;116(1):e113-e9.
8. Wolfram RM, Chehne F, Oguogho A, Sinzinger H. Narghile (water pipe) smoking influences platelet function and (iso-) eicosanoids. *Life sciences*. 2003;74(1):47-53.
9. Syed N, Rani K, Memon MQ. SHISHA-SMOKING. *The Professional Medical Journal*. 2015;22(02):200-3.
10. Omotehinwa OJ, Japheths O, Damascene IJ, Habtu M. Shisha use among students in a private university in Kigali city, Rwanda: prevalence and associated factors. *BMC public health*. 2018;18(1):713.
11. Taha AZ, Sabra AA, Al-Mustafa ZZ, Al-Awami HR, Al-Khalaf MA, Al-Momen MM. Water pipe (shisha) smoking among male students of medical colleges in the eastern region of Saudi Arabia. *Annals of Saudi medicine*. 2010;30(3):222-6.
12. Abu Shomar RT, Lubbad IK, El Ansari W, Khatib I, Alharazin HJ. Smoking, awareness of smoking-associated health risks, and knowledge of national tobacco legislation in Gaza, Palestine. 2014.
13. Tucktuck M, Ghandour R, Abu-Rmeileh NM. Waterpipe and cigarette tobacco smoking among Palestinian university students: a cross-sectional study. *BMC public health*. 2018;18(1):1.
14. Hoh A. China's Belt and Road Initiative in Central Asia and the Middle East. *Digest of Middle East Studies*. 2019.
15. Cochran JA. The Rise in Power of Crown Prince Mohammed bin Salman. *Digest of Middle East Studies*. 2019.
16. Saleh RN, Salameh RA, Yhya HH, Sweileh WM. Disordered eating attitudes in female students of An-Najah National University: a cross-sectional study. *J Eat Disord*. 2018;6(1):16.
17. Al-Qerem WA, Hammad AM, AlQireem RA, Ling J. Do the global lung function initiative reference equations reflect a sample of adult Middle Eastern population? *The Clinical Respiratory Journal*. 2019.

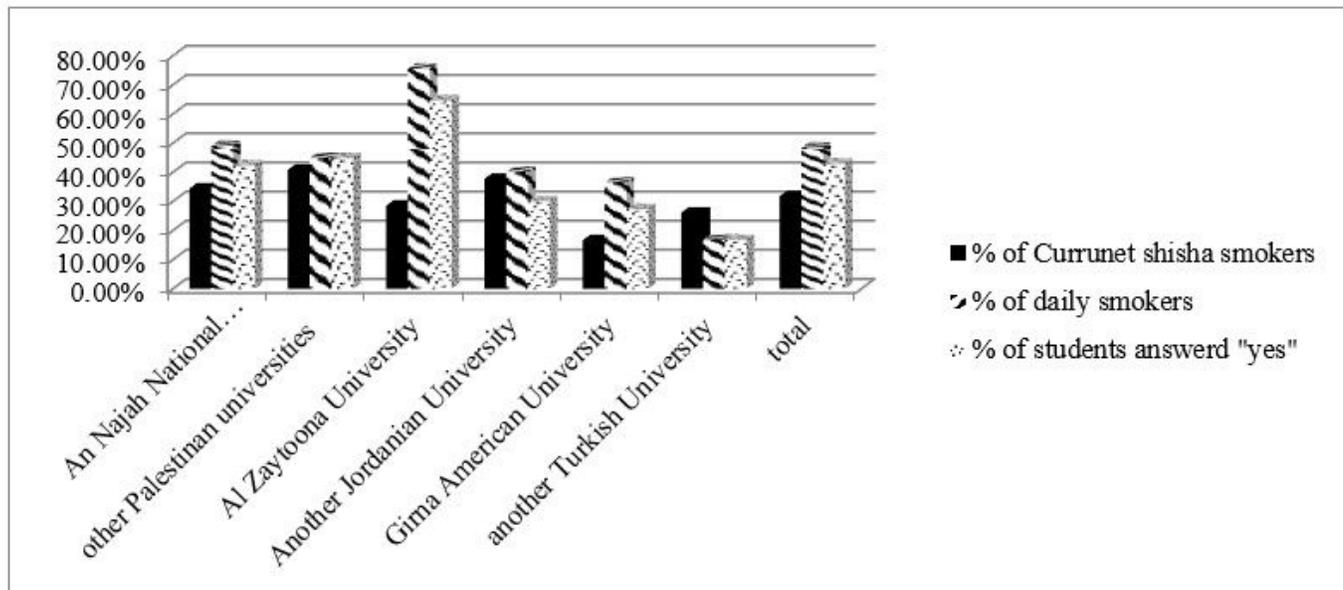
18. Jarrar Y, Mosleh R, Hawash M, Jarrar Q. Knowledge And Attitudes Of Pharmacy Students Towards Pharmacogenomics Among Universities In Jordan And West Bank Of Palestine. *Pharmacogenomics and Personalized Medicine*. 2019;12:247.
19. Sturgeon LP, Garrett-Wright D, Lartey G, Jones MS, Bormann L, House S. A descriptive study of bathing practices in acute care facilities in the United States. *American Journal of Infection Control*. 2019;47(1):23-6.
20. Murray CJ, Lopez AD. Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study. *Lancet (London, England)*. 1997;349(9063):1436-42.
21. Social norms and attitudes linked to waterpipe use in the Eastern Mediterranean Region. 2013. p. 125-34.
22. Factors associated with hookah smoking among university students. 2016. p. 3403-8.
23. Pleasure and practice: a qualitative study of the individual and social underpinnings of shisha use in cafes among youth in the UK. 2018. p. e018989.
24. Mosleh RS, Jarrar Y, Zyoud SH, Morisky DE. Factors Related to Diabetes Self-Care Management Behaviors Among Patients with Type II Diabetes in Palestine. *Journal of Applied Pharmaceutical Science*. 2017;7(12):102-9.
25. Al Ghobain M, Ahmed A, Abdrablnabi Z, Mutairi W, Al Khathaami A. Prevalence of and attitudes to waterpipe smoking among Saudi Arabian physicians. *East Mediterr Health J*. 2018;24(3):277-82.
26. Bashirian S, Barati M, Abasi H, Sharma M, Karami M. The role of sociodemographic factors associated with water pipe smoking among male adolescents in western Iran: A cross-sectional study. *TobInduc Dis*. 2018;16:29.
27. Saqib MAN, Rafique I, Qureshi H, Munir MA, Bashir R, Arif BW, et al. Burden of Tobacco in Pakistan: Findings From Global Adult Tobacco Survey 2014. *Nicotine & Tobacco Research*. 2017;20(9):1138-43.
28. Mugenyi AEK, Haberer JE, O'Neil I. Pleasure and practice: a qualitative study of the individual and social underpinnings of shisha use in cafes among youth in the UK. *BMJ Open*. 2018;8(4):e018989.
29. Maziak W, Taleb ZB, Bahelah R, Islam F, Jaber R, Auf R, et al. The global epidemiology of waterpipe smoking. *Tobacco Control*. 2015;24(Suppl 1):i3-i12.
30. Othman M, Aghamohammadi N, Nik Farid ND. Determinants of shisha use among secondary school students in Sudan. *BMC Public Health*. 2019;19(1):1390.
31. Veeranki SP, Alzyoud S, Kheirallah KA, Pbert L. Waterpipe Use and Susceptibility to Cigarette Smoking Among Never-Smoking Youth. *American Journal of Preventive Medicine*. 2015;49(4):502-11.
32. AlQahtani J. Knowledge, attitude and practice of tobacco smoking among health colleges' students at Najran University, Saudi Arabia: A cross-sectional descriptive study. *Journal of Health Specialties*. 2017;5(1):35-41.
33. Eissenberg T. Now is the Time for Effective Regulation Regarding Tobacco Smoking Using a Waterpipe (Hookah). *Journal of Adolescent Health*. 2019;64(6):685-6.

## Figures



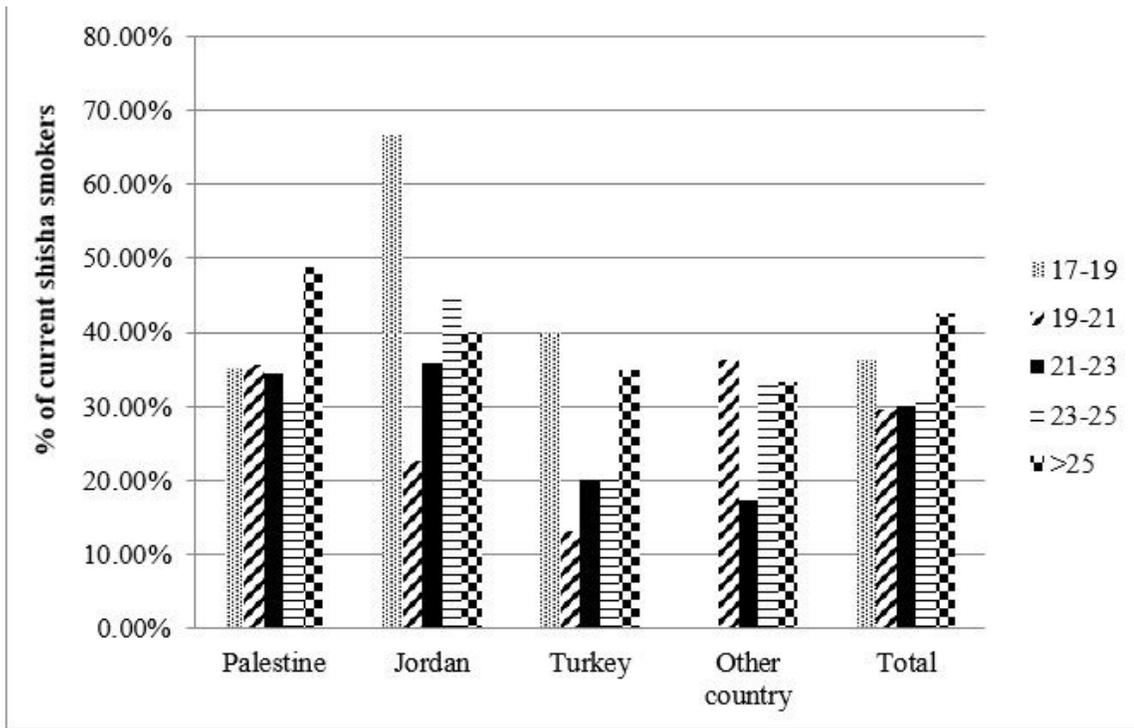
**Figure 1**

the total prevalence of shisha smokers, and the prevalence of current, ever, never smokers according to nationalities.



**Figure 2**

the percentage differences of shisha smoker's prevalence, daily smokers, and students answered "yes".



**Figure 3**

the prevalence of smoking shisha in different countries (Palestine, Jordan, Turkey and other country) according to different age category (17-19, 19-21 years old etc.).

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [STROBEchecklist.docx](#)