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Prevalence of water-pipe smoking and associated factors among university students in Palestine: a cross sectional study†

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ABSTRACT

Water-pipe smoking (WPS) has become popular in many Middle Eastern countries, especially among university and high school students of both genders. Reports show that the prevalence of WPS among Palestinian youth is increasing. However, there is little data that focuses on the pattern of WPS among Palestinian university students. The aim of this study is to explore the prevalence of, and factors affecting WPS among students at a major Palestinian university. A self-administered questionnaire was distributed to a random sample of university students. It included items addressing demographics, water-pipe use and patterns of utilization. Participants represented all disciplines of study, both males and females and all socio-economic classes. The proportion of current WPS was computed and its relation with relevant demographic characteristics was assessed. Almost one fourth (22.8%) of the study sample was identified as current water-pipe smokers. This proportion was significantly higher among males, faculty of humanities and social sciences, cigarette smokers and among students living with friends in rented house. The mean age of starting WPS was 16.6 years for males and 17.6 years for female and 57.9% of WP smokers reported that first experience with WPS was in the company of friends. In conclusion WPS has become significant enough among university students to be of concern and to the focus of future antismoking programs with special attention paid to students living with friends in shared housing situations.

Keywords: Prevalence; Waterpipe tobacco smoking; University Students; Palestine.

† The research draws from the master thesis of the student Mai Abu Al-Halaweh entitled: Water-Pipe Smoking and Associated Factors among An-Najah National University Students, which was discussed at An-Najah National University on 24/5/2015.

INTRODUCTION

Tobacco use in its various forms is increasing in developing countries. In addition to its impact on disease morbidity and mortality, it increases the burden of poverty, reduces productivity and increases health-care costs [1].

Water-pipe smoking (WPS) is arising public health problem worldwide especially in the Middle Eastern region. In 2005, the World Health Organization (WHO) issued an advisory note calling for a better understanding of national and global trends of water-pipe tobacco smoking [2]. The American Lung Association in 2007 labelled WPS as an 'emerging deadly trend', and called for more research on the patterns of WPS use amongst various populations [3].

The prevalence of WPS in the Middle East is increasing in youth when compared with cigarette smoking. The Global Youth Tobacco Survey (GYTS) indicated that the use of tobacco products other than cigarettes, predominantly WPS, was more common than use of cigarettes [4]. Studying the behavior of university students is important as they serve as role models for other young adults and the majority of health risk behaviors are established in young adulthood [5]. Many studies have shown the prevalence of current WPS among university students to be high; 30% in

Jordan [6], 33% in Pakistan, 28% in Lebanon, and 15% in Syria [3]. In Iran, 11.5% of the female and 28.7% of the male university students have been reported as WPS [7].

WP and cigarette smoke contain many of the same toxins and hazardous substances [8] that have serious adverse health effects including creating dependence [9], increasing the risk of acute respiratory diseases due to sharing of WP mouth piece among smokers [10] and the likelihood of chronic obstructive pulmonary disease [11]. Other more serious negative health outcomes include increased risk of developing cancers, cardiovascular diseases and negative pregnancy outcome [2, 10, 11]

Although many studies have been performed on cigarette use among Palestinian students, studies on WPS are limited. However, the prevalence of WPS among Palestinian population appears to be high. Data from the Global Youth Tobacco Survey among adolescents (13–15 years old) reported that the second highest past 30-days prevalence of WTS was the West Bank in the occupied Palestinian territories (oPt) (32.7%) [12]. This indicates that Palestinian youth are increasingly exposed to an emerging hazard that is a threat to their health and that more data are needed to understand the extent and pattern of this behavior among Palestinians both youth and adults.

At present there is no study published addressing the issue of WPS in the universities of the West-Bank/Palestine. The aim of current study was to investigate the prevalence of and factors associated with WPS among students at major Palestinian University. The results of this study are expected to provide baseline data regarding WPS in Palestinian university students.

METHODS

Study design & setting

Across-sectional study was conducted at one of the largest Palestinian universities where students from all West Bank governorates are enrolled and represents the range of social classes. Students from all departments of study were included in the sample.

Sample size and sampling technique

To achieve a confidence level of 95% and standard error of 5% and based on expected proportion (P) of 30% for WPS [11, 13] the sample size was calculated to be 336 students. To be able to compare between the water-pipe smokers and non-smokers, we multiplied the calculated sample size by 2, then added 20% to compensate for incomplete answers. Thus the total sample size calculated for this study was 810 students.

A systematic random sampling technique was implemented to select students from the obligatory courses which include students from all departments and all levels. At the end, 36 classes were selected randomly and visited by the researcher. While visiting each class; permission was taken first from the lecturer and before disseminating the questionnaire a brief description of the study and its objectives was given to the participants. The Study was conducted during the period July to August 2014.

The main outcome variable for this study was the "water-pipe use profile". It was operationalized based on the number of times a participant had smoked water-pipe as follows: (I) Current water-pipe smoker: was defined as anyone who used water-pipe one time or more in the past 30 days. The frequency of WPS was described as daily, weekly and monthly [11]. (II) Ever water-pipe smoker, anyone who had ever tried water-pipe but did not complete a session ever, or anyone who had previously smoked and had quit [14]. For analysis purposes, the non-current WP smoker variable included those who were ever water-pipe smokers and those who had never smoked or tried WP.

Measurement tool

A self-administered questionnaire designed for this study was used to collect data. The questionnaire was constructed and developed from a literature review and questions adapted from previously published related studies [9-11, 15-17]. It was translated into Arabic and reviewed by three experts in the field. After that, it was piloted on a group of 40 university students in order to assess the ease flow and understandability of the questions. To assess the internal consistency of the questionnaire, the Cronbach's' alpha was computed with results ranging from 0.77 to 0.79(defined as "very good").

The questionnaire was divided into 3 sections; (i) demographics including age, gender, department of study, place of original residence, place of residence during university study, marital status, monthly average income, and average monthly spending on water-pipe smoking, (ii) WPS behavior or WPS status, current level of water pipe-use, cigarette smoking status and (iii) participants' intention to quit WPS.

Data analysis

Data entry and analysis were performed using the SPSS version 17. P-value <0.05 was set as a criterion of statistical significance. Frequencies and proportions were calculated for categorical variables and mean and standard deviation for continuous variables. The relationship between the study outcomes and the independent variables was assessed using the chi-squared test and *t*-test as appropriate.

Ethical approvals

The study was approved by the institutional review board (IRB) of An-Najah National University (ANU) and appropriate permissions were received from the university administration. Informed consent was obtained from all individual participants included in the study. The anonymity of the participants and confidentiality of the collected data were assured.

RESULTS

A total of 810 university students were randomly selected and invited to participate in the study; among them 750 students completed and returned the questionnaire with a response rate of 92.5%. Almost half of the study group was female and resided in a village before being enrolled at the university and 82.3% of participants were currently residing with their families. Table 1 shows the demographic characteristics of the study participants.

Table (1): Demographic characteristics of the study participants in relation to Water-pipe status (n = 750).

Characteristic	**Total** (%)	**Current WP smokers** n=171(%)	**Non-current WP smokers** n=579 (%)	**P-value^**
Gender				
Male	350(46.8%)	124 (35.4%)	226 (64.6%)	< 0.001
Female	400(53.3%)	47 (11.8%)	353 (88.5%)	
Age group				
≤19 years	350(46.7%)	71 (20.3%)	279 (79.7%)	
20-21 years	317 (42.3%)	67 (21.1%)	250 (78.9%)	< 0.001
>21years	83(11.1%)	33 (39.8%)	50 (60.2%)	
Department				
Humanities and Social	449 (59.9%)	114 (25.4%)	335 (74.6%)	
Engineering and IT	131 (17.5%)	32 (24.4%)	99 (75.6%)	

Characteristic	**Total** (%)	**Current WP smokers** n=171(%)	**Non-current WP smokers** n=579 (%)	**P-value^**
Natural sciences	82 (11.7%)	14 (17.1%)	68 (82.9%)	0.033
Medicine	88 (10.9%)	11 (12.5%)	77 (87.5%)	
Place of residence				
City	326 (43.5%)	83 (25.5%)	242 (74.5%)	
Village	395 (52.7%)	78 (19.7%)	317 (80.3%)	0.057
Camp	29 (3.9%)	10 (34.5%)	19 (65.5%)	
Place of residence during studying				
Family Home	617 (82.3%)	132 (21.4%)	485 (78.6%)	
With friends in rented house	110 (14.7%)	34 (30.9%)	76 (69.1%)	0.09
Alone in rented house	23 (3.1%)	5 (21.7%)	18 (78.3%)	
Cigarette Smoking				
Yes	120 (16.1%)	71 (41.5%)	50 (8.7%)	< 0.001
No	630 (83.9%)	100 (58.5%)	529 (91.3%)	
Marital status				
Single	714 (94.9%)	160 (22.3%)	554 (77.7%)	0.34
Married	36 (4.8%)	11 (30.6%)	25 (69.4%)	

^ *Pearson Chi-Square Test*

Prevalence of Water-Pipe Smoking

About one forth (22.8%) of the students were identified as current WP smokers and another 34.3% reported as having used water-pipe tobacco (6.4% were former-WP smokers and 27.9% had tried WP for curiosity) (Figure 1). About 16% of the study participants were current cigarette smokers; two third of them were also current water-pipe smokers.

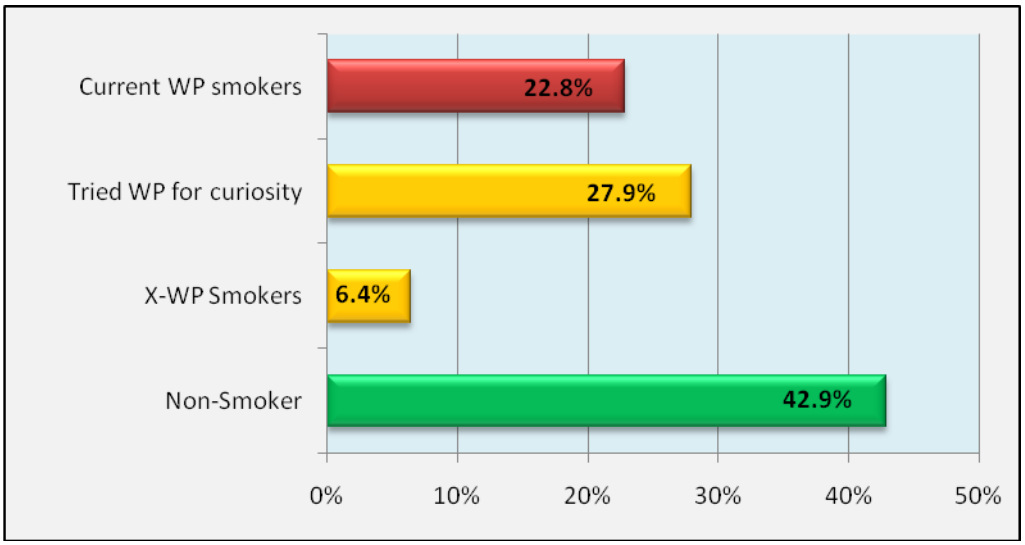

Figure (1): Distribution of the Water-pipe smoking status among the university students (n=750).

Males were more likely to report that they are currently using water-pipe (35.5%) compared to females (11.5%) with P-value < 0.001. Students from the department of Humanities and Social Sciences constituted the highest proportion of water-pipe smokers (25.4%) compared 12.5% from the department of Medicine and Health Sciences (P-

value = 0.033). Significantly higher proportions of students who reported living with their friends while studying were current WP smokers compared to students living with their families or alone in rented houses (P-value = 0.09).

The relationship between cigarette smoking and WPS status was found to be significant; 41.5% of current water-pipe smokers were also cigarette smokers, compared to 8.7% of the non-current WP smokers (P-value < 0.001) (Table 1).

The prevalence of WPS appears to increase with age. It was 20.3% among the ≤ 20 years' age group compared to 45.2% among ≥ 20 years. This difference was found to be statistically significant (P-value = 0.005) (Figure 2).

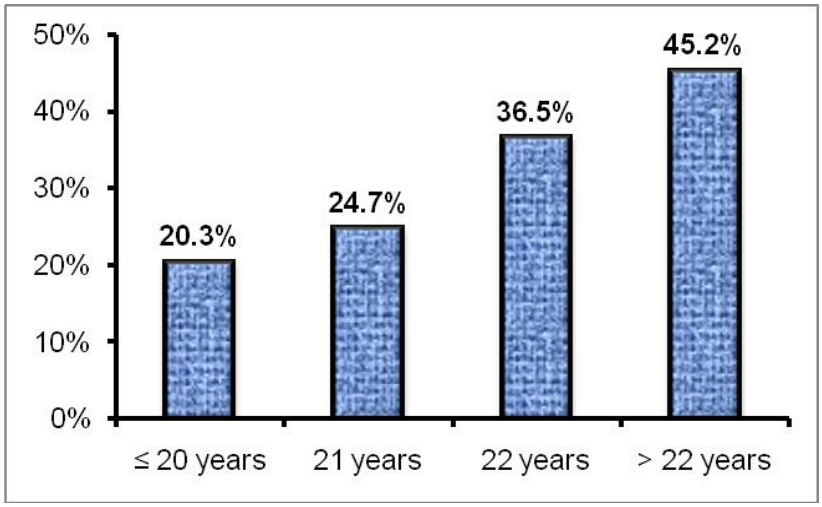

Figure (2): Prevalence of water-pipe smoking by age groups.

Behavior and patterns of water-pipe use

Table 2 shows the general behaviors and patterns of WPS among the current WP smokers and characteristics related to first use. The mean age of initial WPS was 16.6 years for males and 17.6 years for female; the difference between these groups was found to be statistically significant (t(168): -3.050, P-value = 0.003). About two thirds (57.9%) of initial WPS use was in company of friends. Cafés and/or restaurants were the most common places for students to start WP smoking (38.0%), and 40% of the current WP smokers smoke daily, whereas 45.0% smoke on weekly basis. The majority of students (81.3%) use WP with their friends and 59.1% of them has at least four or more of their close friends who agree with their smoking water-pipe.

Table (2): Behavior and patterns of water-pipe use among current water-pipe smokers (n=171)

Behavior	**Frequency** (%)
Age of starting WPS *(mean ±SD)* **:**	
Male	16.6 years ±1.9
Female	17.6 years ±1.7
First use company:	
With friends	99 (57.9%)
With family	31 (18.1%)
Group of family and friends	29 (17.0%)
Alone	12 (7.0%)
Place of first use:	
Cafe or restaurant	65 (38.0%)
At home	53 (31.0%)
At friend home	28 (16.4%)

Behavior	Frequency (%)
Other places	25 (14.6%)
Average use of WP:	
Weekly	77 (45.0%)
Daily	70 (41.0%)
Monthly	24 (14.0%)
Place of smoking WP most often:	
In a cafe	78 (45.6%)
At my home	76 (44.5%)
At friends home	17 (9.9%)
Company of WP smoking most often:	
With friends	139 (81.2%)
With family members	70 (40.9%)
Alone	46 (26.9%)
Average duration of WP smoking session:	
Less or equal half an hour to 1 hour	107 (62.5%)
More than 1 hour to 2 hours	49 (28.7%)
More than 3 hours	15 (8.8%)
Frequency of sharing the same mouth piece of WP:	
All or most of the times	78 (45.6%)
Few times	65 (38.0%)
Never	28 (16.4%)
Number of closest friends who agree on WP smoking:	
One to three friends	70 (40.9%)
More than three friends	101 (59.1%)
Favorite flavor:	
Whole mixed fruit (Maasel)	167 (97.7%)
Tobacco (Agame)	4 (2.3%)

Intention and perceived Ability to discontinue WPS

Almost half of the WP smokers (49.7%) reported that they have never tried to discontinue WP smoking; and approximately one quarter of smokers (24.0%) had no plans to quit at any time; 89smokers (52.0%) reported feeling that they can discontinue WPS at any time they want, whereas 67 smokers (39.2%) considered themselves "hooked" on smoking tobacco with water-pipe (table 3).

Table (3): Current water-pipe smokers intention for quitting and their perceived control over themselves regarding water-pipe smoking behavior (n = 171).

Characteristic	Frequency (%)
Intention for quitting WPS:	
Yes	66 (38.6%)
No	41 (24.0%)
Don't know	64 (37.4%)
Previous trial of quitting WPS:	
Never	85 (49.7%)
Several times	44 (25.7%)
Once	42 (24.6%)
I consider myself "hooked" on smoking tobacco with water-pipe	67 (39.2%)
I feel it is difficult to quit water-pipe smoking	64 (37.4%)
I feel I can quit water-pipe smoking at any time if I want	89 (52.0%)

DISCUSSION

Over three decades, compelling evidence regarding the hazards of WPS has accumulated in the literature. Unfortunately, questions regarding WPS are not generally included in routine surveillance of tobacco use; resulting in very little population level data being available in most countries [12].

The sample size (750 students) is considered large enough to reflect the WP smoking pattern of the university students. It was larger than that of several published studies among university students [9, 18-20].

The study population was equally distributed in regard to gender and department of study. Almost half of the participants were female, which is comparable to the general university population where equal proportions of male and female exist [21]. Although 59.9% of students were in the department of Humanities and Social Sciences; this is consistent with university enrollment as Humanities and Social Sciences is the largest department including seven different branches of study.

The prevalence of current WPS among study participants was 22.8%, which is comparable to results from Eastern Mediterranean region such as in Syria (22.0%) [18], Jordan (25.0%) [22] and Lebanon (25.0%) [3]. Findings indicate that this region is one of the highest in WPS use creating a serious need for active and effective interventions to limit the spread of this health hazard.

Approximately one third of the university students (34.3%) reported to having used water-pipe tobacco in their life time. This is lower than that reported in similar studies done in neighboring countries; 42.5% in Iran [5], 48.0% in Syria [18], and 56.0% in Jordan [6]. This lower rate could be a result of differences in the definition of the category of ever having used WP.

The prevalence of cigarette smoking found in the study population was 16.1%; lower than the prevalence of WPS (22.8%). Approximately 60% of current WP smokers were not cigarette smokers; indicating that the WPS phenomena is becoming more accepted and widely spread than cigarette smoking in the Palestinian culture and families. It appears that those social attitudes are becoming laxer especially regarding females using WP. This is noted when comparing the WPS with cigarette smoking among females (11.5% and 3.8% respectively). These findings are consistent with results from neighboring countries such as Jordan [6], Syria [18] and Iran [5] and could indicate a change in the social attitude and acceptance toward WPS for young women.

The prevalence of WPS and cigarette smoking collectively (38.9%) was found to be higher than findings of a previous study done in 2010 0n university students, which had been reported at 34.7%, and both of these results were higher than the Palestinian Central Bureau of statistics estimates (2009) of the proportion of smokers in the general Palestinian population which was 19.8% (37.0% among males and 2.2% among females) [21].This emphasizes the fact that tobacco consumption trends are increasing among our population especially youth.

The results showed that current cigarette smokers are at 3.3 times greater risk of smoking WP than non-cigarette smokers. Among Syrian university student's cigarette smokers were about four times more likely to be WP smoker than non-cigarette smokers [18], whereas in a US study this was reported to be as much as 10.4 times more likely [17]. These findings may indicate that one of these two behaviors is a possible "gateway" to the other; suggesting that it may be appropriate to target water-pipe smokers as part of an effort to reduce cigarette use in some settings.

Males were significantly associated with smoking WP higher by 2.6 times than females. This was consistent with findings in similar studies conducted in the Eastern Med-

iterranean region [5, 6, 18, 22]. However, when comparing the difference in prevalence of WPS in male and female students it was lower than previously shown in a similar study on the prevalence of both cigarette and WP smoking among university students which was done in 2010 [21]; indicating that females are smoking more, especially WPS.

Interestingly, the prevalence of WPS increased with age in the current study. These findings are similar to what has been found in other studies [5, 6], suggesting that as students grow older, the family pressure to refrain from smoking is decreased and they become exposed to more reinforcing risk factors such as peer pressure, indicating possibly that WPS is propagated through student culture.

Living in a rented house with friends was also associated with higher use (by 4.3times) of WPS as opposed to living alone or with family. This is consistent with western data [23-24] which generally shows increased use of WP among students who live away from their parents; which emphasizes the important influence of peer pressure on increasing the prevalence of WPS in a student population.

The department of study was found to be a protective factor for using WP; as students from faculty of Health Sciences had lower WP use then peers from other departments. This may be related to the nature of their study where education on the health risks of smoking is part of the curricula [21].

Noticeably, this study revealed that students started WPS at an early age (16.6 years for males and 17.6 years for females); and this was found to be much earlier than reported in other countries such as Jordan (18.1 years) [5], Syria (19.6 years) [18]. This indicates again that Palestinian society and families are becoming more and more permissive in regards to tobacco smoking especially by WP which is accepted more than cigarette smoking. This difference may be related to the ease in accessibility and availability of WP in cafes and restaurants which do not have any age restrictions. This theory is reinforced in the results of our students which show that more than one third of smokers had their first use of WP in cafes or restaurants.

Although most smokers (57.9%) reported starting WPS in the company of friends, a substantial proportion (35.1%) report they were with their family members or a group of friends, which stresses the role of family in formulating unwanted social habits like WPS. This is comparable with results of a previous Jordanian study [22].

Discouragingly the majority of WP smokers in this study reported high average use of WP (40.9% daily and 45.0% weekly). These results reflect those of Tucktuck et al. (2018) who found that a high prevalence of WPS was reported among university students [26]. These findings also were much higher than other populations, such as Iranian students (4.4% were daily smokers) [5], Syrian male students (7.0% were daily smokers) [25], and Jordanian students (18.1% daily smokers) [22], suggesting that Palestinian students are more prone to addiction with WPS. This is supported by the finding that 39.2% of participants define themselves as "hooked" to WPS. These findings indicate that immediate action is needed to change student behavior and attitude if a decrease in WPS use is to be proposed. Another high risk health behavior among the WPS was noted in that approximately half of smokers share the same mouth piece with others all or most of the time. This was similar to the findings in students in the Jordanian universities [22]. Sharing the same mouth piece is an alarming sign for public health concerns regarding the possibility of cross infections.

Some limitations of the current study deserve to be mentioned. This study has a cross-sectional design; so temporal relationships and causality cannot be determined; however, the model of study was selected as

it is considered the best design for evaluating the prevalence of a behavior in a population. The study included one university which could limit its generalizability. In the future, it would be useful to repeat this survey in other Palestinian universities to ensure findings are reproducible across the general population.

CONCLUSIONS

Findings from this study showed that current WPS is significant among university students as to be of concern and to be included in future efforts toward decreasing and eliminating WP use in this population. Currently WPS prevalence is higher than cigarette smoking, which may reflect the predominance of this type of smoking in the society and the fact that cigarette smoking is being replaced by water-pipe. The majority of WP smokers in this study reported high average use, indicating the possibility of addiction which was reflected in the results that large proportion of them felt that they are "hooked" to this behavior.

These results suggest that it may be valuable to address this problem from a policy perspective; as when such polices remain absent from the public sphere it may be interpreted to signal "acceptance and safety" of WP use which may unintentionally promote its' spread. Additionally, we recommend including the anti water-pipe tobacco use message in tobacco control activities in university settings going forward.

COMPETING INTERESTS

The authors declare that they have no competing interests.

REFERENCES

1) World Health Organization. Mpower: a policy package to reverse the tobacco epidemic. Switzerland: World Health Organization [Internet]. 2008. Available from: http://apps.who.int/iris/bitstream/handle/10665/42665/WHO_TRS_916.pdf;jsessionid=D4DABD80782CE0E7E9B64E5EF4C6BEBE?sequence=1

2) World Health Organization. WHO study group on Tobacco Product Regualation (TobReg). Advisory Note. Waterpipe tobacco smoking: health effects research needs and recommended actions by regulators. Geneva. 2005. Available from: https://www.who.int/tobacco/global_interaction/tobreg/Waterpipe%20recommendation_Final.pdf

3) Akl EA, Gunukula SK, Aleem S, Obeid R, Jaoude PA, Honeine R, et al. The prevalence of waterpipe tobacco smoking among the general and specific populations: A systematic review. BMC Public Health. 2011;11:244

4) Warren CW, Lea V, Lee J, Jones NR, Asma S, McKenna M. Change in tobacco use among 13-15 year olds between 1999 and 2008: findings from the Global Youth Tobacco Survey. Glob Health Promot. 2009;16(2 Suppl):38–9.

5) Sabahy AR, Divsalar K, Bahreinifar S, Marzban M, Nakhaee N. Waterpipe tobacco use among Iranian university students: Correlates and perceived reasons for use. Int J Tuberc Lung Dis. 2011;15(6):844–7.

6) Khabour OF, Alzoubi KH, Eissenberg T, Mehrotra P, Azab M, Carroll M V., et al. Waterpipe tobacco and cigarette smoking among university students in Jordan. Int J Tuberc Lung Dis. 2012;16(7):986–92.

7) Ghafouri N, Hirsch JD, Heydari G, Morello CM, Kuo GM, Singh RF. Waterpipe smoking among health sciences university students in Iran: Perceptions, practices and patterns of use. BMC Res Notes. 2011;4:496.

8) Shihadeh A, Saleh R. Polycyclic aromatic hydrocarbons, carbon monoxide, "tar", and nicotine in the mainstream smoke aerosol of the narghile water pipe. Food Chem Toxicol. 2005;43(5):655–61.

9) Heinz AJ, Giedgowd GE, Crane NA, Veilleux JC, Conrad M, Braun AR, et al. A comprehensive examination of hookah

smoking in college students: Use patterns and contexts, social norms and attitudes, harm perception, psychological correlates and co-occurring substance use. Addict Behav. 2013;38(11):2751–60.

10) Nuwayhid IA, Yamout B, Azar G, Kambris MAK. Narghile (hubble-bubble) smoking, low birth weight, and other pregnancy outcomes. Am J Epidemiol. 1998;148(4):375–83.

11) Maziak W, Ward KD, Afifi Soweid RA, Eissenberg T. Tobacco smoking using a waterpipe: A re-emerging strain in a global epidemic. Tob Control. 2004;13(4):327–33.

12) Jawad M, Lee JT, Millett C. Waterpipe tobacco smoking prevalence and correlates in 25 eastern mediterranean and Eastern European countries: Cross-sectional analysis of the global youth tobacco survey. Nicotine Tob Res. 2016;18(4):395–402.

13) Aljarrah K, Ababneh ZQ, Al-Delaimy WK. Perceptions of hookah smoking harmfulness: Predictors and characteristics among current hookah users. Tob Induc Dis. 2009;5:16.

14) Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. Nat Rev Endocrinol. 2018;14(2):88–98.

15) Jawad M, Lee JT, Millett C. The relationship between waterpipe and cigarette smoking in low and middle income countries: Cross-sectional analysis of the global adult tobacco survey. PLoS One. 2014;9(3): e93097.

16) Khabour OF, Alsatari ES, Azab M, Alzoubi KH, Sadiq MF. Assessment of genotoxicity of waterpipe and cigarette smoking in lymphocytes using the sister-chromatid exchange assay: A comparative study. Environ Mol Mutagen. 2011;52(3):224–8.

17) Jarrett T, Blosnich J, Tworek C, Horn K. Hookah use among U.S. College students: Results from the National College Health Assessment II. Nicotine Tob Res. 2012;14(10):1145–53.

18) Maziak W, Eissenberg T, Rastam S, Hammal F, Asfar T, Bachir ME, et al. Beliefs and attitudes related to narghile (waterpipe) smoking among university students in Syria. Ann Epidemiol. 2004;14(9):646–54.

19) Braun RE, Glassman T, Wohlwend J, Whewell A, Reindl DM. Hookah use among college students from a Midwest University. J Community Health. 2012;37(2):294–8.

20) Nuzzo E, Shensa A, Kim KH, Fine MJ, Barnett TE, Cook R, et al. Associations between hookah tobacco smoking knowledge and hookah smoking behavior among US college students. Health Educ Res. 2013;28(1):92–100.

21) Musmar SG. Smoking habits and attitudes among university students in palestine: A cross-sectional study. East Mediterr Heal J. 2012;18(5):454–60.

22) Dar-Odeh NS, Bakri FG, Al-Omiri MK, Al-Mashni HM, Eimar HA, Khraisat AS, et al. Narghile (water pipe) smoking among university students in Jordan: Prevalence, pattern and beliefs. Harm Reduct J. 2010;7:10.

23) Smith-Simone S, Maziak W, Ward K, Eissenberg T. Waterpipe tobacco smoking: Knowledge, attitudes, beliefs, and behavior in two U.S. samples. Nicotine Tob Res. 2008;10(2):393–8.

24) Smith SY, Curbow B, Stillman FA. Harm perception of nicotine products in college freshmen. Nicotine Tob Res. 2007;9(9):977–82.

25) Maziak W, Fouad FM, Asfar T, Hammal F, Bachir EM, Rastam S, et al. Prevalence and characteristics of narghile smoking among university students in Syria. Int J Tuberc Lung Dis. 2004;8(7):882–9.

26) Tucktuck M, Ghandour R, Abu-Rmeileh NME. Waterpipe and cigarette tobacco smoking among Palestinian university students: a cross-sectional study. BMC Public Health. 2017;18(1):1.