Chapter

The Use of Waterpipe Tobacco Products and Its Associated Risk Factors among University of Limpopo Students, South Africa

Kotsedi Daniel Monyeki, Hlengani James Siweya and Phut Johanna Makgae

Abstract

The use of tobacco products is a modifiable risk factor for non-communicable diseases. The aim of the study was to determine the prevalence of waterpipe tobacco product use and associated risk factors amongst University of Limpopo students aged 17–43 years. This cross-sectional study comprises 916 (415 males and 501 females) University of Limpopo students aged 17–43 years. The questionnaire was validated for the University of Limpopo student population before it was used. Logistic regression was used to determine the associated risk factors for waterpipe tobacco product use among the University of Limpopo students. Staying on campus (OR 2.54 95%CI 1.87 3.44) or off-campus (0.39 95%CI 0.29 0.54) was significantly ($p<0.05$) associated with using waterpipe tobacco products even after adjusting for age and gender and receiving a bursary (on Campus OR=3.8095%CI 2.59 5.57) off-campus (0.26 95%CI 0.18 0.39). Our results demonstrate that waterpipe smoking was more prevalent among university male students than female students. Liking the taste and difficulties to refuse were significantly ($p<0.05$) associated with the use of waterpipe amongst University students. Future research should investigate the association of waterpipe use with risk factors for non-communicable diseases over time.

Keywords: waterpipe, NFSAS, current use, lifestyle, tobacco products university students

1. Introduction

Tobacco products have been widely reported all over the world in various populations with health effects as risk factors to non-communicable diseases [1]. By 2030, more than 80% of the deaths in developing countries could be accounted for by tobacco-related implications [2]. There are emerging methods of tobacco use that have become alarmingly common in specific population groups which include waterpipe tobacco use also referred to as hubbly bubbly, hooker, narguileh and shisha which

comes in a variety of flavours such as mint, liquorice, strawberry, cappuccino and chocolate [3, 4]. Waterpipe (Hubbly bubbly, hooker, narguileh and shisha) is known by different titles depending on the segment of the globe it is being used as a form of tobacco delivery [4]. Briefly, 'the waterpipe instrument is set up with charcoal, filters, a bowl of water, rubber pipe and varying flavours'. The delivery of tobacco smoke moves through the rubber pipe attached to the bowl that directs large volumes of smoke inhaled into the mouth. Waterpipe smokers are exposed to the noxious materials of the tobacco smoke such as carbon monoxide, nitric oxide, nicotine, polycyclic aromatic hydrocarbons, nanoparticles, volatile aldehydes and furans [5]. Aboaziza and Eissenberg [6] reported that waterpipe smoking is associated with nicotine dependence and smoking-related diseases including cancer, cardiovascular disease, lung disease and adverse pregnancy outcomes. Students are knowledgeable about harmful health effects associated with waterpipe tobacco product use but continue to use it for a variety of reasons which include taste, peer pressure and easy availability [7]. Furthermore, university students regard waterpipe tobacco as a socially acceptable, popular, pleasant social experience and looks cooler than smoking cigarettes [8–10].

The prevalence of waterpipe smoking varies with areas of the world in student communities due to multifactorial influences [4]. A student study at the University of Beirut, Lebanon, reported 43% ever user and 28% of current smoking [2], while another study in the same country contrastingly reported current waterpipe use at 21% [11]. Kilic and Kasap [12] found in the American region 10% ever user and a 41% current use of waterpipe tobacco product use. In North Africa, it was found that men were four times most likely to report waterpipe smoking, with 64% of the sample investigated reporting long-term consumption [7]. In South Africa, waterpipe tobacco product use was reported to be 40% amongst Western Cape university students [7]. Van der Merwe *et al*, [13] reported 11% waterpipe tobacco product use among University of Cape Town students with social settings as the main reasons for using it. Furthermore, Miri-Moghaddam et al., [14] reported that friends played crucial roles in the high prevalence (78%) of waterpipe smoking amongst medical students in Iran.

University environments across the globe provide a unique opportunity for students to experiment with waterpipe tobacco smoking which can eventually become a lifelong use. However, little is known about the prevalence of waterpipe tobacco use amongst University of Limpopo students in the Limpopo province of South Africa. The study aimed to determine the prevalence of waterpipe tobacco products use and to investigate the associated risk factors amongst among University of Limpopo students aged 17–43 years.

2. Materials and methods

2.1 Geographical area

This cross-sectional study was carried out at the University of Limpopo, South Africa. The University of Limpopo is situated in the foothills of the Hwiti (Wolkberg range) in Mankweng Township (23.8837° S, 29.7079° E), midway between Polokwane and Magoebaskloof. It is a predominantly African ethnicity dominated student community. Most students come from low- and middle-income families and are receiving funding in the form of a government bursary called South African National Student Financial Aid Scheme (NSFAS). The students rely mostly on this NSFAS bursary scheme to cover their university expenses and other essentials.

2.2 Sampling procedure

Using STATA, the sample size required for the study was calculated based on a power of 80% and a two-tailed significance level of 5%, the prevalence of waterpipe smoking was 0.24% amongst university students with an alternative proportion of 20% [3, 15, 16].

A convenient sample of 916 students (415 males' mean age is 22.02 years, sd 2.97, and 501 females' mean age is 21.16, sd 2.71) aged 17–43 years, who were enrolled in all the faculties (Humanities, Health Sciences, Management and Law and Science and Agriculture) of the University of Limpopo in 2019 participated in this study.

2.3 Data collection

The questionnaire used in the present study was based on questions which have been used in the Ellisras Longitudinal Study and other studies [3, 15–17]. The questionnaire was shared with experts to ensure content, face and construct validity. It was then revised and piloted with a sample of students to make sure it was valid, reliable, acceptable and accurately understood.

The questionnaire comprised three sections. The first part of the questionnaire included information on age, sex, acquisition of NSFAS bursary, place of residence, the field of study, year of entering the university and the level of study. Briefly, current waterpipe smoker was defined as anyone who uses waterpipe tobacco products regularly or every day during the time of the survey. The following question was asked: 'Do you NOW use waterpipe regularly, at least once every day?' Ever waterpipe users were those who answered that they tried to use waterpipe tobacco products before the survey and have stopped, or they use them occasionally. The question used was: 'Have you ever used waterpipe to smoke (at least once)?' Those who had never used waterpipe tobacco products at the time of the survey were considered non-smokers., 'The onset (initiation age) age for waterpipe use was determined by the question "If yes, indicate how old you were when you first tried this____", How old were you when you first started using waterpipe tobacco everyday/regularly _____.'Onset age was the group as less than 20 years, between 21 and 25 years and over 26 years.

2.3.1 Educational achievements

Participants were asked to indicate their academic status ('first-year undergraduate' through to the third year, fourth year, master's and PhD). First and second-year undergraduates were combined to form 'lower level undergraduate' and third-year study was moderate to high level while fourth year, master's and PhD were grouped as a postgraduate level.

2.3.2 Social factors

Social factors for waterpipe tobacco products use were assessed with the following question: 'One smokes waterpipe tobacco products because I went with others having a good time and felt like inhaling and exhaling together (yes/no), One smokes waterpipe tobacco products because it is difficult to refuse (yes/no), waterpipe tobacco smoking helps me face a difficult situation with confidence (yes/no), One smokes waterpipe tobacco products because it gives me energy (yes/no), One smokes waterpipe tobacco products because I like the taste (yes/no)'.

The study received an ethical clearance from the University of Limpopo Ethics committee (TREC/61/2019: IR) before the data collection process commenced.

2.4 Statistical analysis

Descriptive statistics including frequency distributions and percentage frequencies were used to determine the prevalence of waterpipe tobacco product use among University of Limpopo students. A Chi-squared test was used to compare sets of nominal data that had larger frequency counts while the Fisher's exact test was used when frequency cells were small (less than five or ten) between genders [18, 19]. Logistic regression was used to determine the associated risk factors for waterpipe tobacco product use among the University of Limpopo students. All statistical analyses were performed using SPSS version 25. The statistical significance was set at $P< 0.05$.

3. Results

Figure 1 shows the prevalence of ever and current waterpipe use amongst University of Limpopo students. The prevalence of current waterpipe use was significantly ($p<0.05$) high (6.7%) for boys as compared with girls (3%) amongst the University of Limpopo students.

Table 1 shows the onset age and number of quitting attempts for water pipe use amongst University of Limpopo students aged 17–43 years. The prevalence of waterpipe tobacco product use for ever use in the onset age ranges between 1.6 and 3.9% for the age less than 20 years and between 17.8 and 26.7% for ages between 21 and 25 years. For the current waterpipe user, the prevalence was significantly ($p<0.05$) high 4.6% for boys as compared with 1.8% for girls between the ages of 21 and 25 years. It was clear from **Table 1** that 1.2% of the current boys who quit the use of waterpipe smoking lasted for more than a year. 4.6% of boys and 2.0% of girls never tried to quit using waterpipe smoking.

Table 2 presents the frequencies and percentage frequencies for a positive response for associated risk factors in using waterpipe tobacco amongst University of Limpopo students aged 17 to 43. A total of 70.6% of boys and 77% of girls stay on campus for the duration of their study while 29.4% of boys and 23% of girls stay

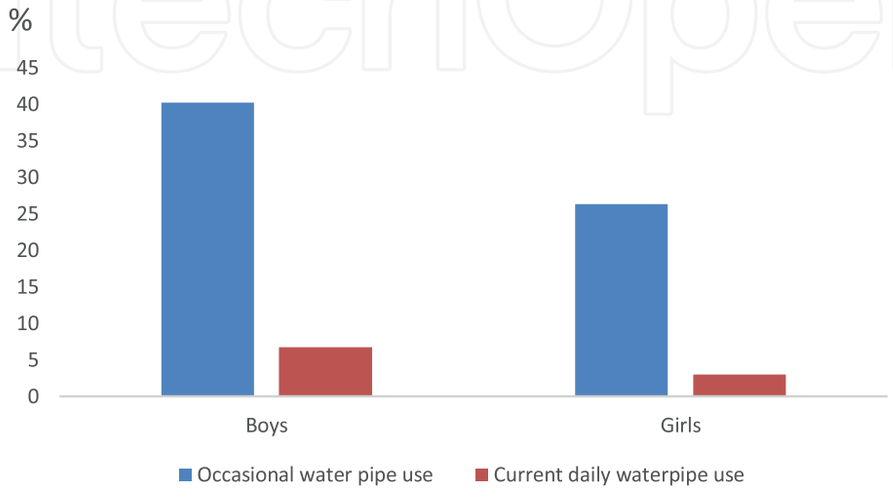

Figure 1.
Prevalence of occasional and current waterpipe use amongst University of Limpopo students.

	Boys N=415		Girls N=501	
	%	**(n)**	**%**	**(n)**
Ever water pipe use				
Less than 20 years	3.9	(16)	1.6	(8)
21 to 25 years	26.7*	(111)	17.6*	(88)
Over 26 years	9.6	(40)	7.2	(36)
Current water pipe use				
Less than 20 years	0.2	(1)	—	—
21 to 25 years	4.6*	(19)	1.8*	(9)
Over 26 years	1.9	(8)	1.2	(6)
Never tried to quit	4.6	(19)	2.0	(10)
Less than seven times a week	1.7	(7)	0.8	(4)
More than seven times a week	0.5	(2)	0.2	(1)
Less than a month	0.7	(3)	—	—
More than six months	0.5	(2)	0.8	(4)
More than a year	1.2	(5)	0.2	(1)

**=p<0.05.*

Table 1.
Onset age and number of quitting attempts for waterpipe use amongst University of Limpopo students aged 17–43 years.

	Boys N=415		Girls N=501	
	%	**(n)**	**%**	**(n)**
Student residences				
On campus	70.6	(293)	77	(386)
Off-campus	29.4	(122)	23	(115)
Educational level				
Lower level	58.6	(235)	53.9	(270)
Moderate high level	23.1	(96)	25.5	(128)
Postgraduate level	20.2	(84)	20.6	(103)
Social factors				
Some smoke because they went with others having a good time and felt like inhaling and exhaling together	3.1*	(13)	0.2*	(1)
Some smoke because it is difficult to refuse	5.8*	(24)	1.6*	(8)
Some smoke because they like the taste	7.0	(29)	1.8	(9)
Some smoke because it gives them energy	10.6*	(44)	2.4*	(12)
Helps me face difficulties with confidence	6.0	(25)	2.4	(12)
Received NSFAS	71.8	(298)	80.2	(402)
Other bursaries than NSFAS	12.0	(50)	9.8	(49)

**=p<0.05.*

Table 2.
Frequencies and percentage frequencies for a positive response for associated risk factors in using waterpipe tobacco amongst University of Limpopo students aged 17–43.

off-campus. A total of 5.8% boys and 1.6% girls who are currently using waterpipe smoking reported that it was difficult to refuse using waterpipe smoking while 7.0% of boys and 1.8% of girls reported that they like the taste of using waterpipe tobacco products, and the difference was significant (P<0.05).

Table 3 shows the logistic regression (odds ratio, 95%CI and P-value)) for the association between waterpipe tobacco product use and associated risk factors amongst University of Limpopo students aged 17–43 years. Older onset age (between 21 and 25 years (OR= 6.7 95%CI 3.63 13.05) and above 26 years (OR= 5.57 95%CI 2.77 11.21) was significantly associated with using waterpipe tobacco products even after adjusting for age, gender and receiving a bursary (21–25 years (OR- 6.98 95%CI 3.60, 13.54 and above 26 years (OR= 5.92 95%CI 2.81 12.49). Staying on campus (OR 2.54 95%CI 1.87 3.44) or off-campus (0.39 95%CI 0.29 0.54) was significantly (p<0.05)

	Unadjusted			**Adjusted for age, gender and receiving bursary***		
	OR	**P-value**	**(95%CI)**	**OR**	**P-value**	**95%CI**
Onset age						
Less than 20 years	0.88	0.902	(0.12 6.67)	0.70	0.731	(0.09 5.40)
20 to 25 years	6.87	0.000	(3.63 13.05)	6.98	0.000	(3.60 13.54)
Over 26 years	5.57	0.000	(2.77 11.21)	5.92	0.000	(2.81 12.49)
Number of times one tried to quit						
Never tried	7.81	0.000	(3.21 9.33)	9.04	0.000	(6.93 12.56)
Less than seven times	0.64	0.221	(0.31 0.86)	0.56	0.231	(0.21 0.96)
More than seven times	0.33	0.143	(0.21 1.37)	0.36	0.153	(0.11 0.95)
Student residence						
Off-Campus	2.54	0.000	(1.87 3.44)	3.80	0.000	(2.59 5.57)
On Campus	0.39	0.000	(0.29 0.54)	0.26	0.000	(0.18 0.39)
Educational level						
Lower level	0.84	0.211	(0.64 1.11)	0.74	0.051	(0.54 1.00)
Moderate high level	1.26	0.146	(0.92 1.73)	1.34	0.079	(0.97 1.85)
Postgraduate level	1.00	0.994	(0.71 1.41)	1.08	0.701	(0.74 1.56)
Social factors						
Went with others having a good time and felt like inhaling and exhaling together	7.98	0.066	(3.41 18.67)	7.19	0.072	(3.04 16.99)
One smokes because it is difficult to refuse	7.84	0.002	(1.66 28.33)	6.54	0.005	(1.76 24.21)
One smokes because I like the taste	12.25	0.000	(5.06 29.65)	11.25	0.000	(4.59 27.58)
One smokes because it give me energy	7.84	0.105	(4.14 14.82)	7.14	0.000	(3.72 13.70)
Help me face difficulties with confidence	8.21	0.082	(3.70 18.19)	7.71	0.021	(3.44 17.27)

**=p<0.05.*

Table 3.
Logistic regression (odds ratio, 95%CI and P-value)) for the association between waterpipe tobacco use and associated risk factors amongst University of Limpopo students aged 17–43 years.

associated with using waterpipe tobacco products even after adjusting for age, gender and receiving a bursary (on Campus OR=3.8095%CI 2.59 5.57) off-campus (0.26 95%CI 0.18 0.39). Liking the taste (OR= 7.84 95%CI 1.66 28.33) and difficult to refuse (OR= 12.25 95%CI 5.06 29.65) were significant ($p<0.05$) using the waterpipe even after adjusting for age gender and receiving bursary (Liking the taste (OR= 6.54 95%CI 1.76 24.21) and difficult to refuse (OR-11.25 95%CI 4.59 27.58).

4. Discussion

This cross-sectional study aimed to investigate the prevalence of waterpipe tobacco product use and associated risk factors among University of Limpopo students aged 17–43 years. The current study confirms a high prevalence (40%) of ever waterpipe smoking and low prevalence of current (6.7%) waterpipe users. Daradka et al. [16] reported the prevalence of 24.2 and 36.04% for current and ever using waterpipe smoking, respectively, amongst University students. The prevalence of ever water smoking was almost 60.7% among Iranian medical students with the current waterpipe smoking prevalence reaching 18.7 and 51% for Iranian medical students and health science students [20]. Waterpipe smoking has become a global public health problem and requires serious attention [21].

In the current study, the prevalence of ever (40.2 vs 26.3%) and current (6.7 vs 3.0%) waterpipe user was significantly ($p<0.05$) high for boys compared with girls amongst University of Limpopo students in each group. Male participants were more likely to report current waterpipe smoking and higher frequencies than their female counterparts as reported by Salloum et al. [22]. However, the current use of waterpipe is not consistent with that of studies in Western Cape Universities, Pretoria Universities and Johannesburg as researchers reported proportion of both males and females being high for both the current and ever water pipe users in these universities [7, 13, 23–25]. An effective waterpipe tobacco control is needed to curb the spread of this dangerous epidemic among both genders in university communities.

In the current study, older age at onset (21–25 years) appeared to be significantly associated with waterpipe smoking usage compared with younger age onset (less than 20 years). Similar findings were reported in other studies [21]. These associations are suggestive and reflect more dependence on waterpipe smoking which may be reflective of social behaviour in university environments. These findings are not surprising given that the older onset of tobacco use is associated with higher nicotine dependence [26]. Furthermore, older students are more conversant with the university environment than first and second-year entering students.

Having friends who are smokers and enjoying the taste were the highest risk factors for waterpipe use among the University of Limpopo students. Similar findings were reported amongst dental students at King Saud University in Riyadh [27]. Student residences were the main factor associated with waterpipe smoking among university students in the current study. University campuses are an ideal setting to reach waterpipe tobacco users and those who may initiate this while on campus [28]. Evidence-based interventions, including tobacco-free campus policies [28] are essential to decrease the initiation and continued use of all forms of tobacco products among university students and across the lifespan [29]. There is a need to further understand factors which may motivate university students to initiate waterpipe tobacco in order to develop prevention intervention [30].

Research had generated a consistent picture of the health risks of waterpipe smoking in the past. Waterpipe smokers clearly show exposure to nicotine, toxicants

and carcinogens associated with smoking-induced disease [6, 31]. Waterpipe smoking acutely decreases heart rate variability and elevates CO, plasma nicotine, blood pressure and heart rate [14]. Furthermore, waterpipe smoking can cause or accelerate the rate of pulmonary and cardiovascular complications as well as cancer [32, 33]. Children exposed to waterpipe smoking have been shown to have higher levels of carcinogenic tobacco-specific nitrosamines [34]. It is suggested that several educational and consultation courses could improve habits and the attitude of students regarding the detrimental effects and dire consequences of waterpipe usage amongst the university community. It is also suggested that implementing strict surveillance on the behaviour of students in the hostel and residential places of students, along with direct cooperation of students' families, is important in reducing, if not completely eradicating, waterpipe usage. Furthermore, the university should provide enough recreation facilities for students as they spent most of their time on campus than at home.

This study has some limitations. First, data collection was based on convenience samples, without systematic regulation of sampling factors. As such, findings may not be generalizable to a broader population, including those who have never tried waterpipe smoking. Sampling was limited to university students and did not include other non-university youth and adult sub-populations around the university. Thirdly, we did not consider health risk factors related to smoking including respiratory complications the students may have ever experienced. Fourthly, the study was cross-sectional; therefore, a change in tobacco use over several years was not examined.

A comprehensive questionnaire which covered almost all aspects of daily lives was another positive point of this survey. The findings from the current study can serve as a basis for additional research to document the public health impact of waterpipe smoking and guide regulatory efforts for waterpipe smoking control in the Limpopo Province of South Africa. Future research would generate new evidence to advance waterpipe tobacco control policies.

5. Conclusions

Our results demonstrate that waterpipe smoking was more prevalent among university male students than female students. Staying on campus or off-campus was significantly ($p<0.05$) associated with using waterpipe tobacco products. Liking the taste and difficult to refuse were possible risk factors significantly associated with waterpipe usage amongst university students. Future studies should investigate the relationship of waterpipe use and the development of chronic diseases lifestyle over time.

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Conflicts of interest

The authors declare no conflict of interest.

Author contributions

Conceptualization, KDM.; methodology, KDM, PJM; software, KDM.; validation, HJS formal analysis, KDM; investigation, HJS; resources, HJS, KDM; data curation, KDM, PJM writing—original draft preparation, KDM.; writing—review and editing, PJM, HJS.; visualization, KDM.; supervision, KDM.; project administration, KDM ; funding acquisition, KDM.

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References

[1] Combrink A, Irwin N, Naidoo K, Plagerson S, Mathee A. High prevalence of hookah smoking among secondary school students in a disadvantaged community in Johannesburg. SAMJ. 2010;**100**:297-299

[2] Fawibe AE, Shittu AO. Prevalence and characteristics of cigarette smokers among undergraduates of the University of Ilorin, Nigeria. Nigerian Journal of Clinical Practice. 2011;**14**(2):201-205. DOI: 10.4103/1119-3077.84016

[3] Rayens MK, Ickes MJ, Butler KM, Wiggins AT, Anderson DG, Ellen J. Hahn University students' perceived risk of and intention to use waterpipe tobacco. Health Education Research. 2017;**32**(4):306-317

[4] Daniels KE, Roman NV. A descriptive study of the perceptions and behaviours of waterpipe use by university students in the Western Cape, South Africa. Tobacco Induced Diseases. 2013;**11**:4-8

[5] Cobb CO, Sahmarani K, Eissenberg T, Shihadeh A. Acute toxicant exposure and cardiac autonomic dysfunction from smoking a single narghile waterpipe with tobacco and with a "healthy" tobacco-free alternative. Toxicology Letters. 2012;**215**(1):70-75

[6] Aboaziza E, Eissenberg T. Waterpipe tobacco smoking: What is the evidence that it supports nicotine/tobacco dependence? Tobacco Control. 2015;**24**(suppl. 1):i44-i53

[7] Kruger L, van Walbeek C, Vellios N. Waterpipe and Cigarette Smoking among University Students in the Western Cape, South Africa. American Journal of Health Behavior. 2016;**40**:416-424

[8] Primack BA, Sidani J, Agarwal AA, Shadel WG, Donny DC, Eissenberg TE. Prevalence of and associations with waterpipe of tobacco smoking US university. Annals of Behavioral Medicine. 2008;**36**:81-86

[9] Noonan D, Patrick ME. Factors associated with perceptions of hookah addictiveness and harmfulness among young adults. Substance Abuse. 2013;**34**:83-85

[10] 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. Addictive Behaviors. 2013;**38**:2751-2760

[11] Khattab A, Javid A, Ghali I, Alzaabi A, Kheder AB, Koniski ML, et al. Smoking habits in the Middle East and North: Results of the BREATHE study. Respiratory Medicine. 2012;**106**:16-24

[12] Kilic DS, Kasap MY. Survey for describing student's smoking behaviour. Procedia—Social and Behavioral Sciences. 2013;**116**:298-302

[13] Van der Merwe N, Banoobhai Y, Gqweta A, Gwala A, Masiea T, Misra M, et al. Hookah pipe smoking among health science student. SAMJ. 2013;**103**:847-849

[14] Miri-Moghaddam M, Shahrakipour M, Nasseri S, Miri-Moghaddam E. Higher prevalence of water pipe compared to cigarette smoking among medical students in Southeast Iran. Central European Journal of Public Health. 2019;**27**(3):188-194. DOI: 10.21101/cejph.a5615

[15] Daradka H, Khabour O, Alzoubi K, Nakkash R, Eissenberg T. Tobacco and waterpipe use among university students in Saudi Arabia: Impact of tobacco sales ban. Eastern Mediterranean Health Journal. 2019;**25**(2):111-118. DOI: 10.26719/emhj.18.021

[16] Othman N, Kasem AO, Faisal A. Salih Waterpipe Smoking among University Students in Sulaimaniyah, Iraqi Kurdistan: Prevalence, attitudes, and associated factors. Tanaffos. 2017;**16**(3):225-232

[17] Mashita RJ, Themane MJ, Monyeki KD. Current smoking among rural South African children: Ellisras Longitudinal Study. BMC Paediatrics. 2011;**11**:58-66

[18] Lauer RM, Clarke WR. Childhood risk factors for high adult blood pressure: The mascatine study. Pediatrics. 1989;**84**:633-641

[19] Altman DG. Practical statistics for Medical Research. London: Chapman & Hall; 1991. pp. 32-88

[20] Sabahy AR, Divsalar K, Bahreinifar S, Marzban M, Nakhaee N. Waterpipe tobacco use among Iranian university students: Correlates and perceived reasons for use. The International Journal of Tuberculosis and Lung Disease. 2011;**15**(6):844-847

[21] 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

[22] Salloum RG, Lee JH, Mostafa A, Abu-Rmeileh NME, Hamadeh RR, Darawad MW, et al. Waterpipe tobacco smoking among University Students in Three Eastern Mediterranean Countries: Patterns, place, and price. Substance Use & Misuse. 2019;**54**(14):2275-2283. DOI: 10.1080/10826084.2019.1645177

[23] Mandil A, BinSaeed A, Ahmad S, Al-Dabbagh R, Alsaadi M, Khan M. Smoking among university students: A gender analysis. Journal of Infection and Public Health. 2010;**3**:179-187

[24] Mbatchou Ngahane BH, Luma H, Mapoure YN, Fotso ZM, Afane Ze E. Correlates of cigarette smoking among university students in Cameroon. The International Journal of Tuberculosis and Lung Disease. 2013;**17**:270-274

[25] Meysamie A, Ghaletaki R, Haghazali M, Asgari F, Rashidi A, Khalilzadeh O, et al. Pattern of tobacco use among the Iranian adult population: Results of the national survey of risk factors of non-communicable diseases. Tobacco Control. 2010;**19**:125-128

[26] Sharapova SR, Phillips E, Sirocco K, Kaminski JW, Leeb RT, Rolle I. Effects of prenatal marijuana exposure on neuropsychological outcomes in children aged 1-11 years: A systematic review. Paediatric and Perinatal Epidemiology. 2018;**32**(6):512-532. DOI: 10.1111/ppe.12505

[27] AlSwuailem AS, AlShehri MK, Al-Sadhan S. Smoking among dental students at King Saud University: Consumption patterns and risk factors. Saudi Dental Journal. 2014;**26**(3):88-95. DOI: 10.1016/j.sdentj.2014.03.003

[28] Lee YO, Bahreinifar S, Ling PM. Understanding tobacco-related attitudes among college and non-college young adult hookah and cigarette users. Journal of American College Health. 2014;**62**:10-18

[29] American College Health Association. Position statement on tobacco on college and university campuses. Journal of American College Health. 2009;**58**:291-292

[30] Martinasek M, Bryant CA. Antecedents of university students' hookah smoking intention. American Journal of Health Behavior. 2013;**37**:599-609

[31] El-Zaatari ZM, Chami HA, Zaatari GS. Health effects associated with waterpipe smoking. Tobacco Control. 2015;**24**(Suppl. 1):i31-i43

[32] Nasseri S, Gurusamy M, Jung B, Lee D, Khang G, Doods H, et al. Kinin B1 receptor antagonist BI113823 reduces acute lung injury. Critical Care Medicine. 2015;**43**(11):e499-e507

[33] Gurusamy M, Nasseri S, Lee H, Jung B, Lee D, Khang G, et al. Kinin B1 receptor antagonist BI113823 reduces allergen-induced airway inflammation and mucus secretion in mice. Pharmacological Research. 2016;**104**:132-139

[34] Kassem NOF, Daffa RM, Liles S, Jackson SR, Kassem NO, Mehta S, et al. Children's exposure to second hand and third hand smoke carcinogens and toxicants in homes of hookah smokers. Nicotine & Tobacco Research. 2014;**16**:961-975