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Patterns of cigarette, hookah and other tobacco product consumption habits among undergraduate students of the University of Sarajevo before the COVID-19 outbreak in Bosnia and Hercegovina, a cross-sectional study

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Parole chiave: Sigarette, hookah, shisha, narghilè, studenti, tabacco, COVID-19

Abstract

Background. *Tobacco products represent a major health risk factor and a potent way to help transmission of COVID-19. Current data regarding consumption of these products in the region are scarce. The aim of this study was to evaluate patterns of cigarette, hookah and other tobacco products consumption among undergraduate students from the University of Sarajevo before the COVID-19 outbreak in the country.*
Methods. *This cross-sectional study based on a National Youth Tobacco Survey (NYTS) was conducted among undergraduate students from the University of Sarajevo in Bosnia and Hercegovina via an online questionnaire from 22nd to 26th of January 2020.*
Results. *Out of 605 students involved in the study, most of them were female (N=429, 70.9%); 363 (60.0%) were enrolled in medical sciences; 159 (26.3%) were attending the 3rd year of their curriculum; 224 (37%) were original from Canton Sarajevo and 514 (84.9%) were living in urban environment. Two hundred thirty five students out of 605 (38.8%) were current smokers and 117 (19.3%) hookah smokers. Being female (OR=0.539, 95% CI 0.368-0.790, p=0.002), in the 1st or 2nd year of study (OR=0.805, 95% CI 0.667-0.972, p=0.024) and living in a rural environment (OR=0.335, 95% CI 0.191-0.585, p<0.001) were associated with reduced risk of cigarette consumption, while older age (22+ years) (OR=1.287, 95% CI 1.122-1.476, p<0.001) increased the same risk. On the other side, being female (OR=0.595, 95% CI 0.380-0.930, p=0.023), of younger age (18-21 years) (OR=0.832, 95% CI 0.743-0.932, p=0.001) and medical science student (OR=0.567, 95% CI 0.328-0.978, p=0.041) were associated with decreased risk of consuming hookah.*
Conclusions. *This study provides an insight in prevalence of smoking among students at the University of Sarajevo. More antismoking efforts are needed, especially in urban environments; and a follow-up study, to be planned in the near future, should determine whether COVID-19 pandemic (and all the modifications of lifestyles connected with it) have eventually changed tobacco consumption patterns among undergraduate students.*

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Introduction

Consumption of cigarettes and other tobacco products poses an important public health problem by increasing the risk of developing cardiovascular illnesses (hypertension, atherosclerosis, atrial fibrillation, coronary artery disease, acute coronary syndrome, heart failure, abdominal aortic aneurysm and venous thromboembolism) (1-3) and respiratory illnesses (bronchitis, bronchiolitis, lower respiratory tract infections and lung cancer) (4). The use of these products also represents a potent way of transmission of coronavirus disease 2019 (COVID-19) and poses a threat to overall public health in present times (5). Despite all the aforementioned considerations, smoking is still one of the most preventable causes of diseases, disabilities and death. The majority of smokers started smoking or were exposed to cigarette smoke before the age of 18 (6-8), even though some researchers (9) reported the first smoking experience even before the age of 13. The onset of smoking in this period leads to various health problems sooner than expected. According to other researchers (10), prevalence of smokers among Bosnia and Hercegovina students, was estimated at 21.2%, with a trend toward increase.

Besides cigarettes, an emerging problem among younger adults between the ages of 19 and 24 in the region is also the popularity of "hookah", due to combined factors such as peer pressure, social acceptance, cultural beliefs and psychological effects (11-13). "Hookah" or "Shisha", also called "narghilè" in the Western Countries, is a multi-stemmed instrument for heating or vaporizing and then smoking either tobacco, flavored tobacco, or even cannabis, hashish, and - in the past - opium. The smoke is passed through a water basin - often glass-based - before inhalation. Hookah smokers consider the combination of hookah and tobacco to be less harmful than cigarette smoking, as a result of a popular belief that the hookah system eliminates dangerous toxins and carcinogens (14). On the contrary, smoking hookah involves approximately a nine times longer exposure time (15) and a significant role in lung, esophagus and nasopharyngeal cancer development (16), as well as acting as a mean of transmission for tuberculosis and *Helicobacter pylori* (17). Researches point that hookah use is not only a way of transmission of COVID-19 (18), but also an independent risk factor for greater severity of the disease. Smoke from hookah exposes its user to tobacco, nicotine, cotinine, acrolein, nitrogen, carbon monoxide, formaldehyde, cobalt, zinc, cadmium, iron, vanadium, aluminum and lead in equal or higher concentrations compared to cigarette smoke (19, 20). Moreover, hookah employers lack adequate knowledge regarding the harmful effects of this object, which further encourages its popularity (11-13).

Data regarding cigarettes and hookah consumption among young people in Bosnia and Hercegovina are scarce. This research aimed to evaluate patterns of cigarette, hookah and other tobacco product consumptions among a group of undergraduate students of the University of Sarajevo, to inform students regarding harmful effects of these products and to appeal on governmental agencies for stricter regulations.

Material and methods

Subjects

This cross-sectional study was conducted among undergraduate students from the University of Sarajevo in Bosnia and Hercegovina. Study data were collected from 22nd to 26th of January 2020 before the appearance of first COVID-19 case in the country, through an anonymous questionnaire which was validated in advance by the University Bioethical Committee and Sector for Education (0101-555) and took approximately 5 minutes to complete. Out of

total 17,134 [(females 11,257, males 5,877); (1st year 4,126, 2nd year 4,159, 3rd year 4,656, 4th year 2,860, 5th year 863, 6th year 470)] undergraduate students from 28 faculties of University of Sarajevo, 605 [(females 429, males 176): (1st year 115, 2nd year 113, 3rd year 159, 4th year 109, 5th year 82, 6th year 37)] students from 23 faculties (excluding Faculty for Criminalistics Criminology and Security Studies, Faculty of Transport and Communications, Faculty of Forestry, Institute for Genetics and Biotechnology and Teacher Training College/Faculty of Pedagogy), who show similar sex and age classes distribution, completed the questionnaire. The minimum sample size calculated for our population was 351 students (z=351, 95% CI, E=5%). The questionnaire, based on a *National Youth Tobacco Survey (NYTS)* (21), was adapted to local characteristics, translated into local languages and distributed via online university Facebook groups through student representatives. Exclusion criteria were (i) being younger than 18 years, (ii) not being a student of the University of Sarajevo and (iii) not being a resident of Bosnia and Herzegovina. All subjects were informed about the objectives of the study, their voluntary participation, including online informed consent and details on how to fill up the questionnaire. The study was approved by the University Bioethical Committee (0101-555).

Study instrument and data collection

This questionnaire consisted of eight sections. The first part assessed the basic information about the subjects i.e. gender, age, study field, year of study, living environment; the second part obtained information considering cigarette consumption; the third part obtained information considering hookah employment; the fourth part assessed Cuban cigarettes consumption; the fifth part assessed pipe smoking practices; the sixth part assessed tobacco chewing habits; the seventh part evaluated attitudes of the subjects towards cigarette smoking and the eight part of the questionnaire evaluated the general knowledge of the subjects and their exposure to tobacco products. According to CDC, current smoker was considered a person who smoked at least 100 cigarettes in his lifetime and who currently smokes cigarettes (22). Due to the fact that one hookah smoking session is equivalent to the consumption of 100 cigarettes, as stated by the WHO "TobReg Advisory Note" (23), hookah smoker was considered only a person who smokes one or more hookahs per month (22, 24).

Statistical analysis

Collected data were statistically analyzed using the Statistical Package for the Social Sciences (SPSS) version 23.0. In order to summarize the data, descriptive statistics were run. The results were displayed in frequencies and percentages [mean (±SD deviation) for normal distributed data and median (25th, 75th percentile) for not-normal distribution]. Binary logistic regression models were run in order to determine independent predictors for cigarette and hookah consumption.

Results

In total 637 subjects completed the questionnaire. After excluding 32 subjects who did not fit the inclusion criteria, the final sample consisted of 605 subjects. Our study sample was mostly female (N=429, 70.9%); studying medical sciences (N=363, 60.0%); 3rd year of their study (N=159, 26.3%); coming from Canton Sarajevo (N=224, 37.0%) and living in urban environment (N=514, 84.9%). Median age of subjects was 22 years (25th and 75th percentile respectively 20 and 23 years) with a range 18-37 years. All other demographic characteristics of the sample are presented in Table 1.

Table 1 - Demographic characteristics of subjects classified by group of tobacco products use (cigarette smokers/ cigarette non-smokers and hookah smokers/hookah non-smokers

		Cigarette smokers N=235	Cigarette non-smokers N=370	Hookah smoker N=117	Hookah non-smoker N=488
Sex	Female	149 (63.4%)	280 (75.7%)	74 (63.2%)	355 (72.7%)
	Male	86 (36.6%)	90 (24.3%)	43 (36.8%)	133 (27.3%)
Age [median (25^{th}, 75^{th} percentile)]		22.0 [(21.0), (23.0)]	22.0 [(20.0),(23.0)]	21.0 [(20.0),(23.0)]	22.0 [(21.0), (23.0)]
Study field	Medical sciences	140 (59.6%)	223 (60.3%)	68 (58.1%)	295 (60.4%)
	Technical sciences	55 (23.4%)	87 (23.5%)	22 (18.8%)	120 (24.6%)
	Social sciences	40 (17.0%)	60 (16.2%)	27 (23.1%)	73 (15.0%)
Year of study	1^{st}	39 (16.6%)	76 (20.5%)	34 (29.0%)	81 (16.6%)
	2^{nd}	49 (20.8%)	64 (17.3%)	21 (17.9%)	92 (18.8%)
	3^{rd}	58 (24.7%)	101 (27.3%)	23 (19.6%)	136 (27.9%)
	4^{th} *	45 (19.1%)	64 (17.3%)	13 (11.1%)	96 (19.7%)
	5^{th} *	32 (13.6%)	50 (13.5%)	15 (12.8%)	67 (13.7%)
	6^{th} *	12 (5.2%)	15 (4.1%)	11 (9.6%)	16 (3.3%)
Environment	Urban	214 (91.0%)	300 (81.0%)	105 (89.7%)	409 (83.8%)
	Rural	21 (9.0%)	70 (19.0%)	12 (10.3%)	79 (16.2%)

At the University of Sarajevo 4^{th} year of study is included not only in Faculty of Medicine, Faculty of Dentistry, Faculty of Veterinary and Faculty of Pharmacy, but some social and technological science faculties such as Faculty of Law and Faculty of Natural Sciences and Mathematics have 4-year undergraduate programs. Only medical sciences such as Faculty of Medicine, Faculty of Dentistry, Faculty of Veterinary Medicine and Faculty of Pharmacy have 5th and 6th year.

Cigarette Consumption Pattern

Out of 605 students involved in the study, 235 (38.8%) were current smokers and 101 (43.0%) smoked every day in the last 30 days. Smoker students usually consumed 1-10 cigarettes per day (N=152, 64.7%) and used light flavored cigarettes (N= 101, 42.9%). Only 23 (9.8%) smokers reported smoking menthol cigarettes. All demographic characteristics of smokers are presented in Table 1. Being female (OR=0.539, p=0.002), of a lower year of study (1^{st} and 2^{nd}) (OR=0.805, p=0.024) and living in rural environment (OR=0.335, p<0.001) were associated with decreased risk for cigarette consumption, while older age (22+years) (OR=1.287, p<0.001) increased the same risk. Independent predictors for cigarette consumption among students are presented in Table 2.

The majority of smokers (N=173, 73.6%) considered smoking cessation with 122 (51.9%) reporting that they have tried quitting 1-5 times in the last year with a usual abstinence period longer than 30 days (N=120, 51.1%). In general half of the smokers (N=122, 51.9%) intend to ultimately quit smoking. Smokers (N = 63, 26.8%) report being advised by their general practitioners (GPs) or dentists to stop smoking because of various health issues.

Hookah and other Tobacco Products Consumption Patterns

Among all the students of the University of Sarajevo, 117 (19.3%) were classified as hookah smokers, but 457 (75.5%) report consuming hookah at least once in their life. The usual age when students tried hookah for the first time was 15 or 16 years (N=58,

Table 2 - Binary logistic regression analysis of independent predictors for consuming cigarettes and hookah among students

Variable	Odds ratio	95% CI	p-value
Independent predictors for consuming cigarettes among students			
Female	0.539	0.368-0.790	0.002
Older age (22+years)	1.287	1.122-1.476	<0.001
Younger year of study (1st and 2nd)	0.805	0.667-0.972	0.024
Rural environment	0.335	0.191-0.585	<0.001
The model was not statistically significant X^2=5.566, p=0.696; it explained 9.8% (Nagelkerke R2) and correctly classified 65.1% of cases.			
Independent predictors for consuming hookah among students			
Female	0.595	0.380-0.930	0.023
Younger age (18-21 years)	0.832	0.743-0.932	0.001
Medical sciences (yes vs no)	0.567	0.328-0.978	0.041
Technical sciences (yes vs no)	0.683	0.366-1.273	0.230
The model was not statistically significant X^2=3.960, p=0.861; it explained 4.9% (Nagelkerke R2) and correctly classified 80.4% of cases.			

49.6%). All demographic characteristics of hookah smokers are displayed in Table 1. Being female (OR=0.595, p=0.023), younger (OR=0.832, p=0.001) and a medical science student (OR=0.567, p=0.041) were associated with reduced risk of consuming hookah. Independent predictors for hookah consumption are displayed in Table 2.

From other tobacco products, students reported consuming cigars or cigarillos (N=215, 35.5%), pipe tobacco (N=38, 6.2%) and chewing tobacco (N=13, 2.1%) at least once in their life. Cigarette, hookah and other tobacco product (cigars, cigarillos, pipe tobacco and chewing tobacco) consumption patterns among students in the last 30 days are presented in Table 3. No independent predictors were identified for any other tobacco product consumption.

Discussion

This study presented trends in cigarette, hookah and other tobacco product smoking habits among students of University of Sarajevo using the adjusted NYTS questionnaire before the COVID-19 outbreak in the country. The analysis has shown that 235 (38.8%) of the subjects involved in this

Table 3 - Cigarette, hookah and other tobacco products (cigars, cigarillos, pipe tobacco and chewing tobacco) consumption patterns among students in the last 30 days

Tobacco product	Tobacco product usage among students over last 30 days		
	0-10 days over last 30 days	11-29 days over last 30 days	All 30 days
Cigarette	53 (22.5%)	81 (34.6%)	101 (42.9)
Hookah	58 (49.6%)	55 (47.0%)	4 (3.4%)
Cigar	12 (80.0%)	1 (6.7%)	2 (13.3%)
Pipe	2 (50.0%)	2 (50.0%)	0 (0.0%)
Chewing tobacco	1 (100.0%)	0 (0.0%)	0 (0.0%)

study were current smokers from whom 101 (42.9%) smokers reported smoking cigarettes on a daily basis. Hookah smoking was reported by 117 (19.3%) students, even though 457 (75.5%) students have tried hookah occasionally, at least once in their life. Published studies regarding cigarette smoking among students in Bosnia and Hercegovina have been linked to specific groups and reported lower prevalence rates of 22.8% for current smokers and 23% for students who consumed cigarettes on a daily basis compared to our data (24). This could be explained by a lower sample size in other studies (25).

Being female was associated with a decreased risk for smoking cigarettes and hookah which is compatible with the information presented by other authors (26, 27). According to these studies, prevalence of smoking cigarettes among men is decreasing which can be explained by men using other types of tobacco products, especially cigars; by urbanization and globalization. These informations are yet to be determined using similar studies in our country.

The highest prevalence of cigarette consume (59.6%) was among students of medical sciences: which could be considered as an alarming information about the inadequacy of the state's health educational system (28). These results also correlate with other studies which show that almost 80% of students didn't consider smoking cessation counseling before the appearance of smoking-related diseases and smoking doctors were less likely to view smoking as harmful as their non–smoking colleagues did (29). In another study, only 26% of active smoking participants received specific training on smoking cessation as a part of public health system improvement (30). According to our data, attending a younger academic year was significantly associated with a decreased risk of smoking cigarettes, and this correlates with other studies (31). Studies conducted in other WHO–European Region countries show a significantly lower smoking prevalence among medical students, although it must be taken into account that the participants in these studies attended younger academic years when the survey was conducted, which can be associated with the aforementioned decreased risk of smoking among younger students (32).

The majority of the smokers, 214 (91.0%), as the majority of the students, came from an urban environment, whereas only 21 (9.0%) had a rural background. On the contrary, studies show that the prevalence of smokers in an urban environment is significantly lower because of the tobacco control and prevention which are implemented in the cities with higher level of socioeconomic development (33). Our results could be linked to poor antismoking programs, huge availability and low prices of cigarettes in cities, cultural acceptance and lack of knowledge regarding health risk of smoking. More programs should be implemented in order to prevent smoking habits and further complications of this habit which are linked to cardiovascular and respiratory illnesses (1-4).

Cigarette consumption was more frequent than the consumption of other tobacco products including cigars, pipes and tobacco chewing, but our study showed also a high prevalence of hookah consumption. There is a similarity between hookah consumption of our data and other studies (34, 35) and consumption of this product could be linked not only to the cultural heritage of the country, but also to the lack of knowledge regarding the harmfulness of it, huge availability and poor or no penalties for selling it to minors. In addition to the aforementioned, a study conducted in European countries without this type of cultural influence shows that cigarettes were the most frequently used tobacco product, while other products such as waterpipe and e – cigarettes were significantly less consumed (36). More studies are needed to assess the widespread

of this habit and possible link to occurrence of other respiratory and cardiovascular diseases.

There are several limitations to our study. The limited number of studies in this country prevents it from being able to systematically asses the trend of smoking different tobacco products and consequently make an evaluation of the tobacco regulations implemented until now. The second thing that we would like to point out is the type of the study. Cross-sectional studies lack the ability to infer causality like other study types. Further researches should also incorporate other tobacco products such as electronic cigarettes and other tobacco heating systems and should be done on a wider population, in order to assess the current situation in the country, and not only among students, but also among other groups. The third limitation of our study is its sample size and reachability. Future studies should have larger and more representative samples and should reach all faculties of the University of Sarajevo and thus show the most punctual information regarding tobacco usage among undergraduate students. Our study sample had similar age distribution pattern as the age distribution of all campus students, but hasn't included all faculties and shown representativeness in all aspects of the population. A follow up study should be done on a larger scale to accurately show patterns of tobacco consumption in the student population of the University of Sarajevo.

This study provides an insight of prevalence of smoking among students at the University of Sarajevo before the COVID-19 outbreak in the country. Regional differences in smoking prevalence indicate that more antismoking efforts are needed especially in urban environments. There is an increased risk of smoking among the students of higher academic years, implying a deficiency in education on tobacco control. Taking into consideration that the physicians have a leading role in tobacco control, a constant effort is needed to control and curb tobacco epidemic among medical students. All these facts should be considered and a follow up study will show if COVID-19 pandemic has changed patters of tobacco product consumption among undergraduate students.

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Riassunto

Modalità d'uso di sigarette, narghilè e altri derivati del tabacco tra gli studenti universitari dell'Università di Sarajevo prima dell'epidemia di COVID-19 in Bosnia ed Ercegovina: uno studio trasversale

Background. L'uso di tabacco e derivati rappresenta un importante fattore di rischio per la salute anche nel favorire la trasmissione di COVID-19. I dati attuali sul consumo di questi prodotti in Bosnia-Hercegovina sono scarsi. Lo scopo di questo studio era valutare i modelli di consumo di sigarette, narghilè e altri prodotti del tabacco tra gli studenti universitari dell'Università di Sarajevo prima dell'epidemia di COVID-19.

Metodi. Questo studio trasversale, basato sul questionario del National Youth Tobacco Survey (NYTS), è stato condotto tra gli studenti universitari dell'Università di Sarajevo in Bosnia ed Erzegovina tramite un'indagine online dal 22 al 26 gennaio 2020.

Risultati. Su 605 studenti coinvolti nello studio, la maggior parte di loro erano donne (N = 429, 70,9%); 363 (60,0%) erano iscritti a scienze mediche; 159 (26,3%) frequentavano il 3 ° anno di curriculum; 224 (37%) erano originari del Cantone di Sarajevo e 514 (84,9%) vivevano in ambiente urbano. Duecentotrentacinque studenti su 605 (38,8%) erano fumatori abituali e 117 (19,3%) fumatori di narghilè. Essere di sesso femminile (OR = 0,539, 95% CI 0,368-0,790, p = 0,002), nel 1° o 2° anno di studio (OR = 0,805, 95% CI 0,667-0,972, p = 0,024) ed il vivere in un ambiente rurale (OR = 0,335, 95% CI 0,191-0,585, p <0,001) erano associati a un ridotto rischio di consumo di sigarette, mentre l'età più avanzata (22+ anni) (OR = 1,287, 95% CI 1,122-1,476, p <0,001) favoriva tale rischio. Dall'altro lato, essere di sesso femminile (OR = 0,595, 95% CI 0,380-0,930, p = 0,023), di età più giovane (18-21 anni) (OR = 0,832, 95% CI 0,743-0,932,

p = 0,001) e studentesse di scienze mediche (OR = 0,567, 95% CI 0,328-0,978, p = 0,041) erano associati a un ridotto rischio di consumare narghilè.

Conclusioni. Questo studio fornisce una panoramica della prevalenza del fumo tra gli studenti dell'Università di Sarajevo. Sono necessari maggiori sforzi contro il fumo, soprattutto negli ambienti urbani; uno studio di follow-up, da pianificare nel prossimo futuro, dovrebbe determinare se la pandemia di COVID-19 (e tutte le modifiche degli stili di vita ad essa connesse) abbia alla fine cambiato i modelli di consumo di tabacco tra gli studenti universitari.

References

1. Kondo T, Nakano Y, Adachi S, Murohara T. Effects of Tobacco Smoking on Cardiovascular Disease. Circ J 2019; ***83***(10): 1980-5. https://doi.org/10.1253/circj.CJ-19-0323.
2. Lee W, Hwang SH, Choi H, Kim H. The association between smoking or passive smoking and cardiovascular diseases using a Bayesian hierarchical model: based on the 2008-2013 Korea Community Health Survey. Epidemiol Health 2017; **39**: e2017026. doi: 10.4178/epih.e2017026.
3. Villablanca AC, Mcdonald JM, Rutledge JC. Smoking and cardiovascular disease. Clin Chest Med 2000; **21**(1): 159-72. doi: 10.1016/s0272-5231(05)70015-0.
4. Jones LL, Hashim A, Mckeever T, Cook DG, Britton J, Leonardi-Bee J. Parental and household smoking and the increased risk of bronchitis, bronchiolitis and other lower respiratory infections in infancy: systematic review and meta-analysis. Respir Res 2011; **12**: 5. doi: 10.1186/1465-9921-12-5.
5. Ahmed N, Maqsood A, Abduljabbar T, Vohra F. Tobacco Smoking a Potential Risk Factor in Transmission of COVID-19 Infection. Pak J Med Sci 2020; **36**(COVID19-S4): S104-7. doi:10.12669/pjms.36.covid19-s4.2739.
6. İçmeli ÖS, Türker H, Gündoğuş B, Çiftci M, Aka aktürk Ü. Behaviours and opinions of adolescent students on smoking. Tuberk Toraks 2016; **64**(3): 217-22. doi: 10.5578/tt.20925.
7. Agu CF, Weaver S, Abel WD, et al. Are Adolescents likely to Start Smoking Early if Their Parents are Smokers? A Study of Jamaican High School Students. Asian Pac J Cancer Prev 2018; **19**(S1): 25-31. doi: 10.22034/APJCP.2018.19.S1.25.
8. Urrutia-Pereira M, Oliano VJ, Aranda CS, Mallol J, Solé D. Prevalence and factors associated with smoking among adolescents. J Pediatr (Rio J) 2017; **93**(3): 230-7. doi: 10.1016/j.jped.2016.07.003. Epub 2016 Nov 22.
9. Domić A, Tahirović H, Sajko MČ. [Cigarette smoking among school adolescents in the Brčko District of Bosnia and Herzegovina: a cross-sectional study]. Croatian. Lijec Vjesn 2016; **138**(7-8): 194-9.
10. Serdarevic N, Katana B, Jaganjac A, Bojicic S, Brankovic S, Mahmutovic J. The Cigarette Smoking, Coffee and Supplements Intake at Students of Sarajevo University. Med Arch 2019; **73**(2): 104-8. doi: 10.5455/medarh.2019.73.104-108.
11. Aanyu C, Kadobera D, Apolot RR, et al. Prevalence, knowledge and practices of shisha smoking among youth in Kampala City, Uganda. Pan Afr Med J 2019; **32**: 61. doi: 10.11604/pamj.2019.32.61.15184.
12. Saravanan C, Attlee A, Sulaiman N. A Cross Sectional Study on Knowledge, Beliefs and Psychosocial Predictors of Shisha Smoking among University Students in Sharjah, United Arab Emirates. Asian Pac J Cancer Prev 2019; **20**(3): 903-9. doi: 10.31557/APJCP.2019.20.3.903.
13. Muzammil, Al Asmari DS, Al Rethaiaa AS, et al. Prevalence and Perception of Shisha Smoking among University Students: A Cross-sectional Study. J Int Soc Prev Community Dent 2019; **9**(3): 275-81. 10.4103/jispcd.JISPCD_407_18.
14. Barnett TE, Livingston MD. Hookah use among adolescents: Differential cognitions about hookah and cigarettes. Addict Behav 2017; **75**: 75-8. doi: 10.1016/j.addbeh.2017.07.007. Epub 2017 Jul 9.
15. Alqahtani MM, Goodfellow LT, Zimmerman RD, Zavorsky GS. Waterpipe Smoking in Health-Care Students: Prevalence, Knowledge, Attitudes, and Motives. Respir Care 2019; **64**(3): 321-7. doi: 10.4187/respcare.06263. Epub 2018 Oct 16.
16. Montazeri Z, Nyiraneza C, El-Katerji H, Little J. Waterpipe smoking and cancer: systematic review and meta-analysis. Tob Control 2017; **26**(1): 92-7. doi: 10.1136/tobaccocontrol-2015-052758. Epub 2016 May 10.
17. Patel MP, Khangoora VS, Marik PE. A Review of the Pulmonary and Health Impacts of Hookah Use. Ann Am Thorac Soc 2019; **16**(10): 1215-9. doi: 10.1513/AnnalsATS.201902-129CME.
18. Shekhar S, Hannah-Shmouni F. Hookah smoking and COVID-19: Call for action. CMAJ 2020;

192(17): E462. doi: 10.1503/cmaj.75332.
19. Shafagoj YA, Mohammed FI, Hadidi KA. Hubble-bubble (water pipe) smoking: levels of nicotine and cotinine in plasma, saliva and urine. Int J Clin Pharmacol Ther 2002; **40**(6): 249-55. doi: 10.5414/cpp40249.
20. Jawad M, Eissenberg T, Salman R, et al. Toxicant inhalation among singleton waterpipe tobacco users in natural settings. Tob Control 2019; **28**(2): 181-8. doi: 10.1136/tobaccocontrol-2017-054230. Epub 2018 May 8.
21. Center for Disease Control and Prevention (CDC). National Youth Tobacco Survey. Available on: https://www.cdc.gov/tobacco/data_statistics/surveys/nyts/index.htm [Last accessed: 2021, Jan 13].
22. Center for Disease Control and Prevention (CDC). Tobacco glossary. Available on: https://www.cdc.gov/nchs/nhis/tobacco/tobacco_glossary.htm [Last accessed: 2021, Jan 13].
23. World Health Organization (WHO). TobReg - advisory note waterpipe tobacco smoking: health effects, research needs and recommended actions by regulators. Available from: htt ps://www.who.int/tobacco/global_interaction/tobreg/waterpipe/en/ [Last accessed 2021, Jan 20].
24. Shihadeh A, Azar S, Antonios C, Haddad A. Towards a topographical model of narghile water-pipe café smoking: a pilot study in a high socioeconomic status neighborhood of Beirut, Lebanon. Pharmacol Biochem Behav 2004; **79**(1): 75-82. doi: 10.1016/j.pbb.2004.06.005.
25. Ibisevic M, Avdic A, Osmanovic E, Kadric N, Avdic S. Cigarette smoking among students at the university of tuzla. Med Arch 2015; 69(2): 127-9. doi: 10.5455/medarh.2015.69.127-129. Epub 2015 Apr 6.
26. Rigotti NA, Lee JE, Wechsler H. US college students' use of tobacco products: results of a national survey. JAMA 2000; **284**(6): 699-705. doi: 10.1001/jama.284.6.699.
27. Memon A, Moody PM, Sugathan TN, et al. Epidemiology of smoking among Kuwaiti adults: prevalence, characteristics, and attitudes. Bull World Health Organ 2000; **78**(11): 1306-15.
28. Nouria H, Abdelaziz AB, Rouis S, et al. Comportement tabagique chez les étudiants en sciences de santé de l'université de Monastir (Tunisie). Tunisie Med 2018; **96**(10-11): 557-70.
29. Cattaruzza MS, West R. Why do doctors and medical students smoke when they must know how harmful it is? Eur J Public Health 2013; **23**(2): 188-9. doi: 10.1093/eurpub/ckt001. Epub 2013 Jan 18.
30. D'Egidio V, Patrissi R, De Vivo G, Chiarini M, Grassi MC, La Torre G. Global Health Professions Student Survey among Healthcare students: a cross sectional study. Ann Ig 2020; **32**(4): 419-29. doi: 10.7416/ai.2020.2365.
31. Wamamili B, Wallace-bell M, Richardson A, Grace RC, Coope P. Cigarette smoking among university students aged 18-24 years in New Zealand: results of the first (baseline) of two national surveys. BMJ Open 2019; **9**(12): e032590. http://dx.doi.org/10.1136/bmjopen-2019-032590.
32. La Torre G, Kirch W, Bes-Rastrollo M, et al. Tobacco use among medical students in Europe: results of a multicentre study using the Global Health Professions Student Survey. Public Health 2012; **126**(2): 159-69. https://doi.org/10.1016/j.puhe.2011.10.009.
33. Niu L, Liu Y, Luo D, Xiao S. Current Smoking Behavior Among Medical Students in Mainland China: A Systematic Review and Meta-Analysis. Asia Pac J Public Health 2018; **30**(7): 610-23. doi: 10.1177/1010539518800339.
34. Anand K, Kanishka, Marwah S. Prevalence and determinants of hookah use among college-going women of Delhi. Natl Med J India 2019; **32**(5): 277-81. doi: 10.4103/0970-258X.295963.
35. Naicker N, Teare J, Albers P, Mathee A. Prevalence of hookah pipe smoking in high-school learners in Johannesburg, South Africa. S Afr Med J 2020; **110**(6): 546-51. https://doi.org/10.7196/SAMJ.2020.v110i6.14333.
36. Balogh E, Faubl N, Riemenschneider H, Balázs P, Bergmann A. Cigarette, waterpipe and e-cigarette use among an international sample of medical students. Cross-sectional multicenter study in Germany and Hungary. BMC Public Health 2018; **18**:591 https://doi.org/10.1186/s12889-018-5494-6.

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