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USE AND KNOWLEDGE OF HOOKAH AMONG HEALTH SCIENCE COLLEGE STUDENTS

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ABSTRACT

This study aims to evaluate the use and knowledge of hookah among university students in the health area. It is a cross-sectional study. Questionnaires were applied to 564 students, with questions about socioeconomic variables, self-rated health, life habits, use and knowledge about the consequences of the use of hookah. The prevalence of occasional use of hookah was 51.8%, with no difference between courses. They were identified as associated to occasional use of hookah: to have monthly family income per capita greater than R\$2,000.00 ($p=0.02$, $OR=1.8$, $IC95\%1.10-3.13$) and to ingest alcohol ($p<0.001$, $OR=5.6$, $IC95\%3.50-8.94$). Among the total of students, 65.9% of those who reported using hookah and 66.8% of those who did not were never instructed by a health professional about their risks. Higher proportions of students reporting occasional use of hookah incorrectly answered questions about hookah being harmful to health ($p=0.02$). Similarly about the level of nicotine that is exposed during a hookah session being smaller when compared to the traditional form ($p<0.001$), and hookah smoking do not harm, as the impurities of the smoke are filtered by the water placed in the container ($p<0.01$). The importance of prevention and treatment actions directed to the use of hookah by university students is emphasized.

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INTRODUCTION

In the last decades, several studies related to health harms caused by traditional smoking have been conducted and published. Global pacts were created in order to control its progress and several countries have developed specific programs to prevent smoking (Malta et al., 2017). As a consequence, smoking has gone from something sophisticated and attractive at its inception to being a dangerous habit nowadays and negatively viewed by society (Brasil, 2017a). However, while smoking control policies have achieved good results over the years and restricted the use of traditional tobacco, on the other hand there has been an increase in the consumption of some tobacco products, such as hookah (Chattopadhyay, 2000).

Hookah is a centuries-old form of tobacco use common in countries in Africa, the Middle East and Asia (Reveles et al., 2013). However, it has gained many fans around the world and has been described in some studies with a higher prevalence of experimentation than the traditional form of tobacco use (Walters et al., 2017). Popularly known in Brazil as waterpipe (Lunelli et al., 2016), it consists of aspirating smoke from the burning of an aromatized tobacco mixture through an instrument consisting of a furnace, a long tube and a small container with water through which the smoke passes to be cooled before reaching the mouth. It can be smoked by one person or in groups (Benedict, 2013). The historical belief that this form of tobacco use is safer and less harmful to health when compared to traditional smoking may have been responsible for the significant increase in users in recent decades (Cakmak and Cinar, 2016). Hookah's popularity is

increasing at a frightening rate, especially among younger people (Beckert *et al.*, 2016). It is estimated that there are currently around 100 million people worldwide who use this form of tobacco. In some countries the experimentation percentage has already surpassed that of traditional smoking (Chattopadhyay, 2000). In Brazil there are few studies with significant samples on this subject, most of the studies conducted with a specific audience, but they already demonstrate the magnitude of the problem (Chaouachi, 2015). The insufficient number of studies and the lack of specific public policies for this tobacco derivative provide the hookah industry with a favorable environment for the spread of this habit among younger people (Chaouachi, 2015). It is noteworthy that numerous toxic agents present in traditional cigarettes and proven to be associated with the development of diseases are also found in hookah and some of these in even higher concentrations (Aklet *et al.*, 2015). Given the above, this study aimed to evaluate the use and knowledge of hookah among health science university students.

MATERIALS AND METHODS

This is a cross-sectional study conducted at a public university located in Southern Brazil, in a medium-sized city, classified as a regional hub and a reference for health science and education. The research involved undergraduate health science students (nursing, pharmacy, medicine and dentistry). Classes consist of an average of 40 students each, except dentistry, which has 60 students in each class. Sample size calculation was performed using the prevalence of having already tried hookah of 43.82% (Martins *et al.*, 2015), assuming a prevalence of 50%, with a significance level of 5%, test power of 90% and a 5% estimation error, which resulted in 529 subjects. Data collection was conducted from March to July 2018, in a classroom at the university campus, at a predetermined time. The research included students aged 18 years and older who were regularly enrolled and who agreed to participate in the study and signed the Informed Consent Form (ICF). Students in the last year of nursing, pharmacy and dentistry and in the last two years of medicine were excluded because those are years of internship. In total, 729 students were regularly enrolled in the four undergraduate courses (excluding internship students), being 135 in nursing, 171 in pharmacy, 159 in medicine and 264 in dentistry. Of this total, 11 students refused to participate, 16 were under 18 years old and 128 were not present in the classroom at the time of data collection and were not found in a second search. In addition, data from 10 pilot study students were not used. Thus, data from 564 students were analyzed: 86 (63.7%) nursing students, 103 (60.2%) pharmacy, 139 (87.4%) medicine and 236 (89.4%) dentistry students.

Prior to definitive data collection, a pilot study was conducted with 10 students to verify possible difficulties in understanding the questions and completing the questionnaires, as well as their acceptance to participate in the research. There was no difficulty in understanding the questions or completing the questionnaires, and all agreed to participate. We used instruments for data collection, all self-applicable and anonymous, consisting of questions regarding socioeconomic variables, self-rated health, lifestyle and information on the use and consequences of hookah use to health. Physical exercise or sport practicing was defined as at least 30 minutes of exercise (moderate/intense) or sport continuously or cumulatively, 3 or more times a week. Smoking was defined as

smoking 100 cigarettes or more in life and self-reported as current smoker. Alcohol intake was defined as the consumption in the last 30 days of 5 or more doses of alcohol on a single occasion, if male, or 4 doses if female (Brasil, 2017b). Questions regarding hookah use and health consequences were elaborated based on studies in the literature, and the use of hookah was defined as having smoked at least once in life (occasional use) (Martins *et al.*, 2015; Martins *et al.*, 2014; Menezes *et al.*, 2015). The prevalence of occasional hookah use was estimated for the total number of students and for each course, comparing the courses. Associations were made in having the outcome variable occasional or non-use of hookah) and socioeconomic variables, self-rated health and lifestyle. Information on use and knowledge of use consequences were compared between courses. To analyze the association between categorical variables, Pearson's chi-square and Fisher's exact tests were used. Multivariate analyses were performed by logistic regression using the enter method to identify variables associated with the occasional use of hookah. Variables with a p value < 0.20 in the bivariate analysis were included in the model, and the odds ratio and respective 95% confidence intervals were calculated. Variables on age when smoked hookah for the first time, number of hookah sessions smoked in the last 30 days, and number of people with whom they shared the same hose during the last session were presented using mean, standard deviation and median. To compare continuous variables, the Mann-Whitney test was used. Normality assessments were verified by histograms and the Shapiro-Wilk test. Data were processed in spreadsheets of Microsoft Office Excel 2010 for Windows. Statistical analysis was performed using the Statistical Package for Social Science program (IBM SPSS Statistics), version 15.0. Statistical significance was set at $p < 0.05$. The project was approved by the Independent Ethics Committee (IEC), under protocol number 2,409,715, CAAE 79731017.4.0000.0105. All study participants signed the Informed Consent Form (ICF) for research subjects, including the pilot study.

RESULTS

Of the 564 students, the prevalence of occasional hookah use was 51.8%. The dentistry course had the highest prevalence, 56.8%, and the lowest prevalence found was for the pharmacy course, 43.7% (Table 1). In addition, 45.9% of all students reported hookah use at least once in the last 30 days prior to data collection. Table 2 shows the distribution of the total number of college students who reported occasional or non-use of hookah, according to socioeconomic variables, self-rated health and lifestyle. Most students were up to 21 years old (52.0%), female (73.6%), White (85.6%), single (97.2%) and with a per capita monthly household income of up to R\$ 2,000.00 (72.6%). Most students (68.9%) self-rated their health as good or very good. More than half of the student sample practiced exercise or sports (58.9%), did not smoke (96.2%) and did not drink alcohol (52.6%). There was a significant association between occasional use of hookah and the variables gender, income, physical exercise or sports, smoking and alcohol consumption (Table 2). Variables that remained significant for occasional use of hookah in logistic regression are shown in Table 3. The highest per-capita monthly household income of R\$ 2,000.00 ($p = 0.02$; OR = 1.8; 95% CI = 1.10-3.13) and alcohol intake ($p < 0.001$; OR = 5.6; 95% CI = 3.50-8.94).

Table 1. Distribution of total students and by undergraduate course, according to the occasional or non-use of hookah (n=564)

Questions	Total	Nursing	Pharmacy	Medicine	Dentistry	p
	n (%)	n (%)	n (%)	n (%)	n (%)	
Hookah Use*						
Yes	292(51.8)	38(44.2)	45(43.7)	75(54.0)	134(56.8)	0.06
No	272(48.2)	48(55.8)	58(56.3)	64(46.0)	102(43.2)	

Source: Authors (2018). *Defined as having smoked at least once in life. Pearson's Chi-Square Test used. Total values vary slightly due to some missing information for the variable.

Table 2. Distribution of total college students who reported occasional or non-use of hookah according to socioeconomic variables, self-rated health and lifestyle (n=564)

Variables	Total n (%)	Occasional use of hookah*		p
		Yes n (%)	No n (%)	
Age in years				
Up to 21	292(52.0)	143(49.1)	149(55.2)	0.15
21 or older	269(48.0)	148(50.9)	121(44.8)	
Gender				
Male	149(26.4)	94(32.2)	55(20.2)	0.001
Female	415(73.6)	198(75.6)	217(79.8)	
Skin color				
Black or other	44(15.1)	44(15.1)	37(13.7)	0.63
White	482(85.6)	248(84.9)	234(86.3)	
Marital status				
Single	548(97.2)	287(98.3)	261(96.0)	0.10
Married/living as married	16(2.8)	5(1.7)	11(4.0)	
Monthly household income per capita** in reais				
More than 2,000.00	113(27.4)	71(32.6)	42(21.6)	0.01
Up to 2,000.00	299(72.6)	147(67.4)	152(78.4)	
Health self-assessment				
Very poor or poor or neither poor nor good	175(31.1)	93(32.0)	82(30.3)	0.66
Good or very good	387(68.9)	198(68.0)	189(69.7)	
Physical exercise or sports				
No	220(41.1)	97(35.3)	123(47.3)	<0.01
Yes	315(58.9)	178(64.7)	137(52.7)	
Current smoking				
Yes	21(3.8)	20(6.9)	1(0.4)	<0.001
No	535(96.2)	268(93.1)	267(99.6)	
Alcohol intake				
Yes	262(47.4)	196(68.1)	66(24.9)	<0.001
No	291(52.6)	92(31.9)	199(75.1)	

Source: Authors (2018). Pearson's Chi-Square Test used. *Defined as having smoked at least once in life. **The amount of R\$ 2,000.00 was equivalent to 2.1 minimum wages or US\$ 606.06 on 07/01/2017. Total values vary slightly due to some missing information for the variable.

Table 3. Logistic regression model for occasional use of hookah * for total college students

Variables	Odds Ratio	95% Confidence Intervals	p
Monthly household income per capita** in reais	1.8	1.10-3.06	00.3
Alcohol intake	5.4	3.33-8.68	<0.001

Source: Authors (2018). *Defined as having smoked at least once in life. **The amount of R\$ 2,000.00 was equivalent to 2.1 minimum wages or US\$ 606.06 on 07/01/2017. Variables included in the model: age, gender, marital status, monthly per capita household income, physical exercise or sports, current smoking and alcohol intake.

Table 4. Distribution of total students and by undergraduate degree according to information on hookah use (n=564)

Questions	Total	Nursing	Pharmacy	Medicine	Dentistry	p
	n (%)	n (%)	n (%)	n (%)	n (%)	
If you smoke hookah, where do you smoke most often?						
At home or friends' homes	112(52.3)	16(57.1)	12(40.0)	34(64.2)	50(48.6)	0.13*
Bar or other places	102(47.7)	12(42.9)	18(60.0)	19(35.8)	53(51.5)	
	Mean	Mean	Mean	Mean	Mean	
	(sd)	(sd)	(sd)	(sd)	(sd)	
	Median	Median	Median	Median	Median	
If you have ever smoked hookah, how old were you when you first smoked?	17.1	17.4	17.0	17.6	16.9	0.50**
	(3.0)	(2.0)	(2.4)	(4.5)	(2.3)	
	17.0	17.0	17.0	17.0	16.5	

Source: Authors (2018). * Pearson's Chi-Square Test **Kruskal Wallis Test. Total values vary slightly due to some missing information for the variable.

Thus, students with higher incomes who reported alcohol intake were 1.8 and 5.6 times more likely to occasionally use hookah, respectively. Table 4 shows the distribution of total students and by undergraduate course according to information about the use of hookah.

Most participants (52.3%) reported hookah smoking at home or at friends' homes, with no difference between courses. The mean age in relation to the first time they tried hookah was 17.1 years (SD = 3.0), and pharmacy (17.0, SD = 2.4) and dentistry (16.9, SD = 2.3) had the lowest mean age on the first

Table 5. Distribution of total college students who reported occasional or non-use of hookah, according to their knowledge on health consequences of using it

Questions	Occasional use of hookah*		p
	Yes n=292 n (%)	No n=272 n (%)	
Do you believe that hookah is harmful to health?			
Incorrect answers	15(5.2)	4(1.5)	0.02
Correct answers	275(94.8)	266(98.5)	
Is the nicotine level you are exposed during a hookah session lower than the traditional way of smoking?			
Incorrect answers	135(48.4)	75(28.1)	<0.001
Correct answers	144(51.6)	192(71.9)	
Is hookah smoking not harmful because smoke impurities are filtered by the water in the container?			
Incorrect answers	41(14.9)	20(7.4)	<0.01
Correct answers	235(85.1)	250(71.9)	
At some point in your life were you instructed by a healthcare professional about hookah-related health risks?			
No	170(65.9)	155(66.8)	0.05
Yes	88(34.1)	77(33.2)	

Source: Authors (2018).

* Pearson's Chi-Square Test ^aKruskal Wallis Test.

Total values vary slightly due to some missing information for the variable.

try, with no difference between courses. The distribution of the total number of college students who reported occasional or non-use of hookah, according to their knowledge about the health consequences of its use, is presented in Table 5. There was a significant difference in answers of three out of four questions. Larger proportions of students who reported occasional use of hookah answered incorrectly to questions about hookah being harmful to health ($p = 0.02$), about the nicotine level that they are exposed during a hookah session being lower when compared to the traditional form of smoking ($p < 0.001$) and smoking hookah do not cause harm because smoke impurities are filtered by the water in the container ($p < 0.01$). For the fourth question, about having been instructed by a healthcare professional about hookah-related health risks, there was no difference in answers between courses.

DISCUSSION

Results for this study show that hookah smoking was a frequent habit among young college students (51.8%). We found a high rate of occasional hookah use among health science students in all four research courses and in both genders. In a cross-sectional study conducted at a medical school in London with 1st, 2nd, 5th and 6th year students, a similar prevalence of hookah use was also observed in a sample of 489 students (51.7%) (Jawad *et al.*, 2013). However, a higher prevalence of 68% was found in the United States at the University of Minnesota in a study of students from various health science courses (Krenik-Matejcek *et al.*, 2017). However, lower prevalences were found in studies conducted in Brazil, such as hookah use in 47.32% and 46.75% of third and sixth year students, respectively, from the School of Medicine of Universidade de São Paulo (Martins *et al.*, 2014). Another study, which surveyed the characteristics of tobacco products use among dentistry students at an university in Curitiba, found that 16.66% of women and 14.28% of men reported hookah use (Beckert *et al.*, 2016). The prevalence of occasional hookah use for the courses surveyed ranged from 43.7% for the pharmacy course to 56.8% for dentistry. In addition, 45.9% reported using hookah in the last 30 days, a higher value than that observed in the American study, which brought a prevalence of use in the last 30 days of 32% (Krenik-Matejcek *et al.*, 2017). The prevalence of hookah use among students and college students has been increasing at

alarming rates. Taken together, the lack of publicity about the harm caused to health drives its onset, especially among students and college students, who believe that smoking this tobacco derivative is a safe habit (Menezes *et al.*, 2015). Researchers have shown that numerous toxic agents found in cigarettes and proven to be associated with the development of various pathologies are also found in hookah. Among these toxic components are CO, tar, carcinogens, heavy metals (arsenic, cobalt, chromium and lead) and high levels of nicotine, responsible for causing dependence (Borger, 2017). In the present study, a significant association of occasional hookah use was verified in the multivariate analysis, with a per capita income higher than R\$ 2,000.00 and alcohol intake. It seems that the use of hookah is more prevalent in adolescents with higher purchasing power (Malta *et al.*, 2018; Haider *et al.*, 2016), in this study, higher-income students were 1.8 times more likely to occasionally use hookah. Reinforcing these results, in a cross-sectional epidemiological study of 495 students enrolled in public and private schools, hookah use was significantly associated with being enrolled in private schools (RP = 2.23 (1.73; 2.88)) and performing work activities (RP = 1.80 (1.17; 2.78)) (Reveles *et al.*, 2013). It is worth noting that the equipment used for hookah smoking and the tobacco blend (maassel) are not as affordable as traditional cigarettes, a fact that possibly favors its use among higher-income people. It was also observed that students who intake alcohol are 5.6 times more likely to occasionally use hookah than students who do not. Similar data have already been described in the national and international literature (Malta *et al.*, 2018; Rahman *et al.*, 2014). For example, a study conducted in Brazil using data from the National School Health Survey showed that hookah use was positively associated with regular alcohol use (OR = 5.15) (Malta *et al.*, 2018).

It was observed that the most common places used for hookah smoking for total students (52.3%), nursing students (57.1%) and medicine students (64.2%) were at home or at friends' homes. For the pharmacy (60.0%) and dentistry (51.5%) courses, the most common places were bar or other places. In a study of college students in the United States, nearly 60% of respondents reported using hookah in bars and 30% at home or friends' homes (Kassem *et al.*, 2019). In order to attract this audience, hookah bars and cafes are setting up near university

campuses (Malta *et al.*, 2018). Hookah smoking occurs most often in groups during social gatherings with friends or family, in public places or at home, and is a socially acceptable activity (Rahman *et al.*, 2014; Creamer *et al.*, 2017; Kassem *et al.*, 2016). The mean age at the hookah use initiation found in our research was 17.1 years, which is very close to that found in a study at a Midwestern university in the United States, of 17.9 years (Krenik-Matejcek *et al.*, 2017). In a way, the use of hookah among the young ends up being favored, since its use is not widely prohibited in public places, besides the lack of specific legislation to control its trade and consumption, as already exists for traditional smoking. Regarding knowledge about the health consequences of hookah use, a higher proportion of students who reported occasional use of hookah incorrectly answered three of the four questions compared to students who reported not having occasional use of hookah.

Regarding the knowledge of hookah use among medicine students at an university in Brazil, it was found that only 1.2% of hookah smokers and 0.5% of non-smokers mistakenly believed that the use of hookah has less detrimental effects to health because smoke impurities are filtered by the water in the base. Although almost all respondents in the study knew that hookah use is harmful, nearly half of them had already tried it (Martins *et al.*, 2014). In our study, slightly higher percentages were found: 14.9% of students who reported using hookah occasionally and 7.4% of those who did not use hookah also mistakenly answered the question described above. The data from our study suggest that hookah smokers are exposing themselves to health risks due to lack of knowledge. Unlike cigarettes, hookah consumers do not see warning labels of possible health hazards in the hookah smoking tool, neither the description of composition for the tobacco blend used to smoke (Brasil, 2017). As a consequence of the lack of regulation, consumers are being held in the illusion of facing a less harmful product (Khemisset *et al.*, 2016). Researches have shown that the nicotine content of hookah is high. In this sense, this tobacco derivative can cause dependence, as occurs in traditional smoking, in addition to exposure to numerous toxic agents responsible for the development of pathologies (Cakmak and Cinar, 2016). Regarding the question if at any point in their life they had been instructed by a healthcare professional about the health risks related to hookah, most of total students and for each course answered that they had not, and significantly the dentistry course had a higher proportion of students receiving guidance compared to other courses. In a study conducted in Brazil, at an University in the city of Curitiba, which evaluated the use of tobacco products among dentistry students, 36.36% of tobacco products users and 22.92% of nonusers reported they received sufficient information during graduation on consequences, prevention and cessation of use of tobacco products (Beckert *et al.*, 2016).

Our findings indicate the need for monitoring of alternative forms of tobacco use, especially hookah. Also important is the use of hookah as a curriculum theme, preferably at the beginning of academic life, when there are more students in adolescence, when nicotine addiction is more likely to occur. Further studies are needed to understand the link between hookah use and cigarette use and whether cigarette substitution is taking place for other tobacco products. Public policies are needed to raise awareness of the harmfulness of all alternative smoking mechanisms, including hookahs. Our study had some limitations, such as the fact that it was performed in a single institution, not allowing generalizations. As this is a cross-sectional study, it was not possible to assign causality to the

associations found. Student participation was voluntary. However, most students from each course participated in the research, which possibly minimized the possibility of a bias. Despite these limitations, results may contribute to a better understanding of use and knowledge about health consequences of hookah use among health science university students.

Conclusion

The prevalence of occasional hookah use for total students and for each course was considered high. Higher income and alcohol intake were significantly associated with occasional hookah use. Most students have never been instructed by a healthcare professional about the risks of this tobacco derivative. Larger proportions of students who reported occasional use of hookah incorrectly answered questions about hookah. Future studies could investigate trends in hookah use and other variables with potential influence on use, as well as determine the prevalence and knowledge of their use in representative samples of college students across the country. In addition, to evaluate the existence of this theme in the curricula of university courses, especially in health sciences.

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