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ORIGINAL PAPER

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The Effects of Smoking “The Hookah” on the Oral Health of Fourth, Fifth and Sixth-year Students of the Faculty of Dentistry in Sarajevo

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ABSTRACT

Introduction: Cigarette or hookah smoking, as well as alcohol consumption and abuse, are considered to be the most common etiological factors for the onset of oral cavity diseases, such as changes on the lips, tongue, stomatopyrosis, glossopyrosis, candidiasis. **Aim:** Research aims to determine the harmful effect of smoking the hookah as well as other harmful factors on the oral health of the student population of the Faculty of Dentistry in Sarajevo. **Methods:** The fourth, fifth, and sixth-year students of the Faculty of Dentistry in Sarajevo participated in this cross-sectional study. All of them are systemically healthy and consume some harmful habits: smoking cigarettes, alcohol consumption, and hookah. All students participated in the study voluntarily and they signed informed consent before the clinical examination. All the subjects gave an extensive medical history which recorded all the data on oral hygiene, harmful habits, manner and length of consumption; they were also given a clinical examination of the oral mucosa and the periodontium, as well as determining periodontal indices, and oral tests that are used for diagnostic purposes. The data is entered into work charts specially designed for these purposes. **Results:** The results are statistically processed in the SPSS Statistics 21.0 program and are discussed along with the results of other authors, published in relevant databases. **Conclusion:** The conclusion consists of important facts that originate from the results and the discussion.

Keywords: smoking, alcohol, hookah, oral health.

1. INTRODUCTION

The oral cavity daily performs many important activities such as taking food and drink, chewing, and speaking, but it also indicates the general condition of our organism. Doctors of dental medicine can and must participate in the detection of various diseases by a simple examination of the patient's mouth, head, and neck and notice signs and symptoms that may indicate serious health issues (1).

Cigarette or hookah smoking, as well as alcohol consumption and abuse, are considered to be the most common etiological factors for the onset of oral cavity diseases, such as changes on the lips, tongue, stomatopyrosis, glossopyrosis, candidiasis. Epidemiological studies show that the risk for development of oral carcinoma is up to nine times greater in smokers than nonsmokers, and that risk can increase up to 17 times in extremely heavy smokers.

Early oral carcinoma and precancerous lesions are often subtle and asymptomatic, and as such are often ignored by patients until such lesions reach a stage where the symptoms begin to manifest in the form of pain, difficulty wearing dentures, dysphagia, dysarthria, which leads patients to turn to their dentist for help (2).

Even though cigarettes are the most common form of smoking tobacco in the world, the use of hookah is becoming more and more popular. This practice is especially spread in the Middle East, and some would say that it has reached a scale of epidemics (3-6).

Studies in the USA and Holland have shown

that smoking hookah is almost equally popular as smoking cigarettes (7, 8). Due to all of the above, it is important to note that this not a harmless habit at all and to indicate numerous studies that point to the harmful nature of smoking the hookah (9, 10). Besides leading to changes to general health, it also leads to changes to the oral mucosa and the periodontium (10). Alcohol consumption is recognized as the main risk for the development of upper aero-digestive tract carcinoma. In controlled studies on smoking and alcohol consumption in moderate to heavy consumers, there's a three to nine times greater risk for the onset of oral cavity carcinoma (11).

As a result of the effect of alcohol the most common apparent change in the oral mucosa is the color of the mucosa that can be red or pale, and patients list symptoms such as pain, burning and dryness of the mouth, changes on the tongue in the form of tongue papillae atrophy with the clinical picture of the Lingua geographica, and Lingua villosa alba and nigra which lead to a growth of filiform papillae (12, 13).

2. AIMS

The primary aim of our research was to determine the harmful effect of smoking hookah and other harmful effects on the oral health of the student population of the Faculty of Dentistry in Sarajevo. The secondary aim was to identify what are the most common changes in the mucosa and the periodontium that occur in the subjects depending on which harmful factors they consume, and to find the link between the most common changes and the harmful factor.

3. MATERIAL AND METHODS

The fourth, fifth, and sixth-year students of the Faculty of Dentistry in Sarajevo participated in this research. During the research 115 students were examined, out of which 38 students were excluded due to the exclusion criteria, and the research included 77 subjects that met the inclusion criteria. The age of the students ranged from 21 to 29. Before the examination, all of the respondents signed informed consent for voluntary participation in the research. All of the data was entered into work charts specially designed for this research.

The inclusion criteria were that the students are all systemically healthy and that they consume some of the harmful habits listed in the work charts. Exclusion criteria were that the students have some systemic disease and that they do not consume any of the listed harmful habits.

According to the type of research, this is a cross-sectional study. The research was conducted during student practice. All of the subjects were asked questions about harmful habits, and about the manner of conducting oral hygiene, and then they were subjected to the clinical examination which consisted of the examination of oral cavity mucosa, the examination of the periodontium, determining periodontal indices and tests that are used for diagnostic purposes. The research paper was approved by the Ethical Committee of the Faculty of Dentistry with clinics in Sarajevo, Number: 02-

3-4-259-1-3/2020. Results were statistically analyzed and processed in the SPSS Statistics 21.0 program.

4. RESULTS

A total of 77 students participated in this research. 31 were fourth-year students, 30 were fifth-year students, and 16 were sixth-year students. The largest number of students in this research were fourth and fifth-year students (40%) and (39%) respectively. The female gender was dominant with 49 (64%) of subjects. Of the total number of examined students 50 of them (65%) consume cigarettes, of which (23%) are fourth-year, (29%) are fifth-year, and (13%) are sixth-year students. Female students consume cigarettes more (37%) in relation to male students (28%). Out of that number, 49 students smoke up to one pack per day, whereas only one student smokes 1-2 packs per day. Of the total number of students, 30 of them (39%) smoke the hookah, whereas 47 (61%) state that they do not consume the hookah. Female students consume the hookah more - namely 21 (28%), and especially fourth-year female students (13%), whereas male students consume the hookah less, a total of 9 (11%). 12 students smoke the hookah 1-2 times per day, and 18 students 1-2 times per week.

Of the total number of students, 47 students (62%) stated that they consume alcohol, of which 22 were fourth-year students (28%). When observing alcohol consumption, the female gender was slightly more dominant (34%) in relation to males (28%). 29 students (38%) stated that they do not consume alcohol. Out of which, 41 students consumed all kinds of drinks, whereas 6 students consume only beer. When observing the period of 1-5 years, 23 students stated that they consumed alcohol, 19 students consume alcohol for more than 5 years, and only 5 students consume alcohol for up to one year.

Plaque index 0 is registered in 30 students (40%); and plaque index 1 is also registered in 30 students (40%). Plaque index 2 is registered in 14 students (19%).

It can be stated that student subjects maintain good oral hygiene. PI score of 3 is not registered in any of the students.

Year of study	Sex	Age			Total
		age 21 to 23	age 24 to 26	age 27 to 29	
Fourth	Male	7	3		10(13%)
	Female	17	4		21 (27%)
	Total	24 (31%)	7 (9%)		31 (40%)
Fifth	Male	3	5	1	8(10%)
	Female	11	11	1	22(29%)
	Total	14 (19%)	16 (21%)	2 (3%)	30 (39%)
Sixth	Male	1	9		10(13%)
	Female	0	6		6(8%)
	Total	1 (1%)	15 (19%)		16 (21%)
Total	Male	11	17	1	28(36%)
	Female	28	21	1	49(64%)
	Total	39 (51%)	38 (49%)	2 (3%)	77(100%)

Table 1. Sex, age and year of study

		Sex		Year of study		
		Male	Female	Fourth	Fifth	Sixth
		Count	Count	Count	Count	Count
Smoking cigarettes	YES	22	28	18	22	10
	NO	6	21	13	8	6
Cigarettes per day	up to one pack	22	27	18	21	10
	1-2 packs	0	1	0	1	0
	over two packs	0	0	0	0	0
Smoking the hookah	YES	9	21	14	11	5
	NO	19	28	17	19	11
How much per day	1-2 times	3	9	10	2	0
	more than 2 times	0	1	0	1	0
Length of consumption	up to 1 year	1	10	6	4	1
	from 1 to 5 years	4	9	6	5	2
	more than 5 years	4	2	2	2	2
How many times weekly	1 - 2 times	4	14	6	8	4
	2-3 times	1	2	2	0	1
	more than 3 times	0	3	1	2	0
Alcohol consumption	YES	21	26	22	15	10
	NO	7	22	9	14	6
Only beer	YES	3	3	0	3	3
	NO	1	8	3	4	2
All kinds of drinks	YES	18	23	22	12	7
	NO	2	2	0	2	2
Length of alcohol consumption	up to 1 year	1	4	4	1	0
	from 1 to 5 years	8	15	11	8	4
	more than 5 years	12	7	7	6	6

Table 2. Consumption and length of consumption of cigarettes, the hookah and alcohol

Year of study	Sex	Plaque index			Total	Sulcus bleeding index			Total
		0	1	2		0	1	2	
Fourth	Male	3(4%)	3(4%)	4(5%)	10(13%)	2(3%)	6(8%)	2(3%)	10(14%)
	Female	8(11%)	9(12%)	3(4%)	20(27%)	5(7%)	10(14%)	5(7%)	20(28%)
	Total	11(15%)	12(16%)	7(9%)	30(40%)	7(10%)	16(20%)	7(10%)	30(42%)
Fifth	Male	3(4%)	2(3%)	3(4%)	8(11%)	2(3%)	4(5%)	2(3%)	8(11%)
	Female	9(12%)	9(12%)	2(3%)	20(27%)	6(8%)	11(15%)	3(4%)	20(27%)
	Total	12(16%)	11(15%)	5(7%)	28(38%)	8(11%)	15(20%)	5(7%)	28(38%)
Sixth	Male	5(7%)	3(4%)	2(3%)	10(14%)	3(4%)	2(3%)	4(5%)	9(12%)
	Female	2(3%)	4(5%)	0(0%)	6(8%)	3(4%)	3(4%)	0(0%)	6(8%)
	Total	7(10%)	7(9%)	2(3%)	16(22%)	6(8%)	5(7%)	4(5%)	15(20%)
Total	Male	11(15%)	8(11%)	9(12%)	28(38%)	7(10%)	12(16%)	8(11%)	27(37%)
	Female	19(26%)	22(29%)	5(7%)	46(62%)	14(19%)	24(33%)	8(11%)	46(63%)
	Total	30(41%)	30(40%)	14(19%)	74(100%)	21(29%)	36(49%)	16(22%)	73(100%)

Table 3. Plaque index and sulcus bleeding index

Sulcus bleeding index 0 is registered in 21 students (29%). Bleeding index 1, in 36 students (49%), and sulcus bleeding index 2, in 16 students (22%).

C. Albicans is isolated in 44 students (59%). Native test result for C. Albicans has shown the following results: + in 21 students (27%) (Figure 1), out of which 15 students consume cigarettes, 7 consume the hookah, and 15 consume alcohol, which goes to say that cigarettes and alcohol can be considered the cause. ++ in 18 students (25%), out of which 11 students consume cigarettes, 7 the hookah, and 9 consume alcohol, so the cause is probably of multifactorial nature (Figure 2). +++, in 5 students (7%), out of which 4 students consume cigarettes and 4 alcohol, and only one consumes the hookah (Figure 3).

Changes on the lips were registered in 47 students, out of which we recorded Cheilitis exfoliativa in 43 students (92%), and in 4 students (8%) Cheilitis angularis was recorded. Out of the total of 43 students with Cheilitis exfoliativa diagnosis, 26 of them consume cigarettes, the same number consumes alcohol, and 19 students consume the hookah. Based on these findings we can conclude that changes on the lips occur due to multiple factors.

Changes on the tongue were evident in 21 students, and out of that number 12 (57%) were *Lingua plicata*, 3 (14%) were *Lingua geographica*, and 6 (29%) were *Lingua villosa nigra*. *Lingua plicata* was the most present – in 12 students, out of which 7 students consume cigarettes, 6 consume the hookah, and 5 consume alcohol. *Lingua villosa nigra* was the most dominant in cigarette smokers which is all 6 students, out of which 2 students consume the hookah, and two consume alcohol.

Length of hookah and alcohol consumption increases the number of students with Cheilitis exfoliativa and Cheilitis angularis diagnosis. Consuming up to one pack of cigarettes can be associated with the occurrence of Cheilitis exfoliativa.

5. DISCUSSION

The conducted research gives us an insight into the consequences of the harmful habit of smoking "the hookah" on the oral health of students of the Faculty of Dentistry

Native test result for <i>C. Albicans</i>	Smoking cigarettes		Smoking the hookah		Alcohol consumption	
	YES	NO	YES	NO	YES	NO
	Count	Count	Count	Count	Count	Count
+	15	6	7	14	15	6
++	11	7	7	11	9	8
+++	4	1	1	4	4	1

Table 4. Native test results for candida

with clinics in Sarajevo.

The population of young people who consume hookah has been on the constant increase lately, which is also supported by the results of our research. Out of the total number of students 77 (Table 1), 30 of them (39%) smoke the hookah, whereas 47 students (61%) state that they do not consume the hookah. Female students consume hookah more (Table 2).

An assessment of oral hygiene was also conducted within this research, with the aid of plaque index and gingival sulcus bleeding index. The conclusion is that students maintain good oral hygiene which is supported by satisfactory theoretical and practical knowledge on the above-mentioned topic due to the fact that the subjects are fourth, fifth, and sixth-year students of the Faculty of Dentistry (Table 3).

However, most of the students that were diagnosed with inflammatory changes in the gingiva and that had a record of poorer oral hygiene, stated that they consume cigarettes, hookah, or alcohol.

Regardless of the students' knowledge and good oral hygiene maintenance, the hookah has a harmful effect on periodontal health. In their research, Bibars A. R. and the authors confirmed the negative effect of smoking the hookah on periodontal health. Consumers of the hookah

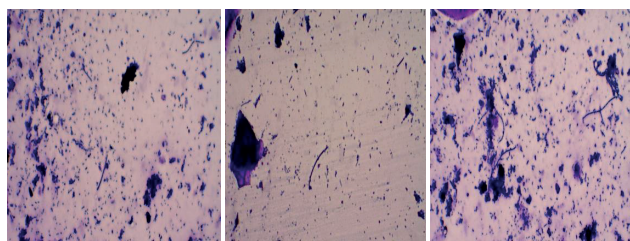


Figure 1. Native finding of *Candida albicans* (+)

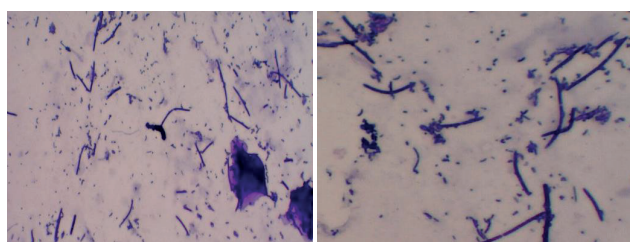


Figure 2. Native finding of *Candida albicans* (++)

have a higher percentage of periodontal diseases in relation to non-smokers. In their research, they remarked that the consumption of the hookah is not and must not be considered to be a healthier alternative to tobacco consumption and that global campaigns are needed to indicate the harmful effects of smoking the hookah (14). The link between smoking hookah and periodontal disease has also been confirmed by other authors in their researches; and in their conclusions, they state that cigarettes and hookah

		Changes on the lips		Changes on the tongue		
		Cheilitis exfoliativa	Cheilitis angularis	Lingua plicata	Lingua geographica	Lingua villosa nigra
		Count	Count	Count	Count	Count
Cigarettes per day	up to one pack	26	3	7	1	6
	1-2 packs	0	0	0	0	0
	more than two packs	0	0	0	0	0
	total	26	3	7	1	6
Length of hookah consumption	up to 1 year	7	1	2	1	0
	from 1 to 5 years	9	1	3	0	2
	more than 5 years	3	0	1	0	0
	total	19	6	6	1	2
Length of alcohol consumption	up to 1 year	4	0	0	0	0
	from 1 to 5 years	12	0	3	0	0
	more than 5 years	10	0	2	2	2
	total	26	0	5	2	2

Table 5. Length of harmful habits consumption with changes on the lips and tongue

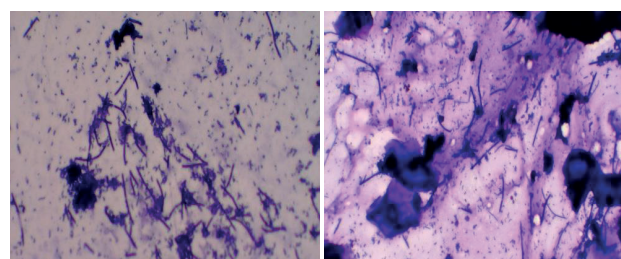


Figure 3. Native finding of *Candida albicans* (+++)

have an equally negative effect on periodontal health (15, 16). A harmful habit of smoking the hookah has a detrimental effect on the oral mucosa as well. Regardless of the manner of tobacco intake, it manifests its harmful thermal and chemical effects.

Our students that stated in the survey that they had some of the harmful habits, smoking the hookah, cigarettes or alcohol consumption, have displayed the most evident changes on the lips and tongue, as well as tested positive on *Candida Albicans* (Table 4, Figure 1, 2, 3).

Changes on the lips were identified in 47 students (Table 5). Out of 30 students that stated they consume the hookah, 24 of them consume it up to five years, and the rest of the students consume it more than 5 years (Table 5).

Results obtained by this research indicate to a more

frequent chronic inflammation of the lips in smokers of the hookah, and mild hyperkeratosis on lip surfaces that are the result of a local combination of thermal and chemical activity, as well as constant mechanical irritation of the same surface of the mucosa. We can also conclude that a relatively short period of consumption still led to the appearance of damage and impairment of oral mucosa health which indicates the need for further research on the harmful effects of smoking the hookah.

Equal damage of the mucosa in smokers of both the hookah and tobacco was confirmed and published by authors Amer, H. W., Waguih, H. M., El-Rouby, D. H. in their research (17). Changes on the tongue were evident in 21 students (Table 5). In our research, all six students that are cigarette smokers and two students that are hookah smokers have a diagnosis of *Lingua villosa nigra* (Table 5).

Several types of research correspond to ours and confirm the presence of this change in cigarette smokers. Farinha, H., Martins, V. researched the connection of the use of electronic cigarettes with the occurrence of the hairy tongue (18). Author Taybos G. also confirms that the most common oral changes in smokers are *lingua villosa nigra* and oral carcinoma (19, 20).

Smoking hookah could have a significant role at the beginning of the neoplastic transformation of epithelial cells of the oral mucosa. This is why we need international cooperation in epidemiological and clinical studies, as well as cellular and molecular research in order to determine the effects of hookah on oral and general health. Researchers from Yemen who examined the changes in the oral mucosa in hookah smokers have histologically confirmed the presence of epithelial dysplasia in relation to the mucosa of nonsmokers (21). Squamous cell carcinoma of the lower lip was noted in long-term users of the hookah. Lip carcinoma is considered the most frequent neoplasm of the oro-maxillary region with greater prevalence in men (22). The connection between tobacco smoking and the presence of oral candidiasis is described and confirmed in a great number of studies (23–25). Most of the students that were diagnosed with *Candida albicans* infection consume either cigarettes or hookah.

The sample in our research is made up of young individuals who deny the presence of systemic diseases and the use of medications so this is considered to be an infection, and the *Candida albicans* isolated in 44 students (59%) occurred by means of the activity of local etiological factors, which is confirmed by other authors (26, 27).

6. CONCLUSION

The most common changes on the lips in our subjects are Cheilitis exfoliativa and Cheilitis angularis. In our sample, the most common change in hookah smokers is *Lingua villosa nigra*, which was present in 2 students who list hookah smoking as a harmful habit, and in 6 students who state that they smoke cigarettes. Half of the students out of thirty who consume the hookah tested positive for a native *Candida albicans* test which can indicate that smoking the hookah presents a local etiological factor in the development of oral candidiasis.

Considering the fact that these are students of a health

faculty, healthy and young persons, and the period of hookah consumption is short, the data is worrying and they call for the need for further research and development of prevention programs. Regardless of age and education, there is a great presence of harmful habits of smoking cigarettes and the hookah, and alcohol consumption. We need prevention programs, public-health campaigns, and organized educations in primary and secondary schools and faculties in order to prevent the youth from experimenting with harmful habits.

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- **Conflict of interest:** None declared.
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