

AWARENESS OF THE EFFECTS OF SHISHA AND ELECTRONIC CIGARETTE SMOKING ON ORAL HEALTH IN SAUDI POPULATION

Nishath Sayed Abdul^{1*}, Nora M. Alshehri², Haifa M. Bindawis², Hadeel K. Alzahrani², Arwa F. Alanezi²

¹ Faculty of Oral Pathology, Department of OMFS and Diagnostic Sciences, College of Dentistry, Riyadh Elm University, Riyadh, Kingdom of Saudi Arabia. ² Dental Interns, College of Dentistry, Riyadh Elm University, Riyadh, Kingdom of Saudi Arabia.

ABSTRACT

Background: Despite the popularity of shisha smoking and electronic cigarette smoking practices among Arab and Middle East countries, the knowledge and awareness of the deleterious effects of these habits have never been investigated among the Saudi population.

Objective: This study aimed to assess and compare the knowledge and awareness of the effects of Shisha and electronic cigarette smoking on the oral health of Saudi dental patients.

Subjects and Methods: This observational, cross-sectional study was conducted among 200 dental patients attending university dental clinics in Riyadh, Saudi Arabia. A self-administered, survey-based questionnaire with questions on the effects of Shisha, electronic cigarettes, and dual smoking on oral health was distributed among smokers and non-smokers. Statistical analysis was performed using descriptive statistics and Chi-square tests. Statistical significance was determined at $p < 0.05$.

Results: A total of 200 participants responded to a cross-sectional study conducted between January 2020 and July 2020. Majority of the participants were males ($n=129, 64.5\%$) than females ($n=71, 35.5\%$). There were 22 (11%) non-smokers, 85 (42.5%) shisha smokers, 59 (29.5%) electronic cigarette smokers, and 34 (17%) dual smokers (Shisha and electronic cigarette). The majority ($n=151, 75.5\%$) of the participants were higher educated with post-graduation and graduation degrees. Shisha ($n=57, 67.1\%$) and dual smokers (67.6%) were aware that smoking causes oral cancer. However, 44% of Electronic cigarette smokers disagreed. The detrimental health effects reported by the participants were cancer and white-coated tongue. The majority (64.7%) of the dual smokers shared smoking with families and friends.

Conclusion: In this study, non-smokers and smokers with higher education, showed more knowledge and awareness of the deleterious effects of smoking on oral health than the lower educated dental patients.

Key words: Shisha, Electronic cigarettes, Knowledge, Awareness, Oral health, Saudi Arabia.

Introduction

Health-promoting behavior is a major criterion for determining health and its ultimate goal is to make health decisions¹⁻⁴. A physician named Hakim Abul-Fath Gilani first introduced Shisha to the world in the 16th century. Shisha is a method of smoking tobacco using a water pipe. It consists of a head that contains tobacco and coal, which is separated by foil. The head is connected to an air system - tight pipes that draw tobacco smoke into a bowl that contains water. When the user inhales through the hose, smoke is drawn in from the bowl to the smoker.⁵ The different terms are used to describe Shisha depending upon different regions and cultures. It is known as Narghile, hookah, Hubble-bubble, and water pipe in different countries.⁶ At present, Shisha is becoming an increasingly popular way of tobacco use worldwide.⁷ Shisha smoking has been associated with

periodontitis, dry socket, premalignant lesions and condition, oral and esophageal cancer, loss of alveolar bone height, hepatitis, herpes, tuberculosis, and susceptibility to candida infections.^{8, 9} Electronic cigarettes (ECIGs) were considered less harmful than conventional cigarettes. It causes dry mouth, caries and periodontitis, implant failures, surgical failures, stains, hairy tongue, and oral cancer.¹⁰

Despite the increased popularity of Shisha and ECIGs smoking among young medical and dental students in Saudi Arabia, to-date, there is limited literature addressing the effects of these products on oral health. However, in a study conducted in Saudi Arabia on the prevalence and perception of Shisha smoking among university dental students, it was found that the knowledge was inadequate among university students.¹¹ Understanding the factors behind the rise in the

popularity and prevalence of Shisha and electronic cigarette smoking among the Saudi population is vital for developing prevention policies and strategies. Therefore, the present study is aimed to assess the level of knowledge and awareness of the effects of Shisha and electronic cigarette smoking on oral health among the Saudi population.

Materials and Methods

Study Design and Sampling

This cross-sectional study was conducted between January 2020 and July 2020 in a sample of dental patients. Researchers distributed a self-administered, close-ended structured questionnaire written in both English and Arabic languages to the 200 dental patients seeking care at Namuthajiya dental clinics of Riyadh Elm University, Riyadh city, Kingdom of Saudi Arabia. Both male and female patients aged between 20-40 years were invited to participate in this study.

A pilot study was conducted to test the validity and feasibility of the study. The content authenticity of the questionnaire was checked on a sample of 25 dental patients to assess the practicability, cogency, and rendition of the answers. The face validity of the questionnaire was established by taking opinions from oral pathologists and dental public health experts. Cronbach's coefficient was found to be 0.80, indicating adequate internal consistency of the study instrument. The questionnaire consisted of 19 items divided into three sections. The first section included questions on demographic details such as age, gender, marital status, education level, and occupation level. The second section contained statements on the practice of smoking. The third section included questions based on knowledge and awareness of the effects of smoking on oral health. Subjects who participated in the pilot study were excluded from the main study.

Inclusion and Exclusion Criteria

Study participants who had smoked Shisha or water pipe and electronic cigarettes at least once daily for one year

categorized as Shisha, and ECIG smokers and dual smokers, respectively, are included. The users of smokeless tobacco products, medically compromised patients with systemic illness, such as diabetes, hypertension, cardiovascular and pulmonary diseases and those undergoing cancer therapy, wearers of partial and/or complete dentures and patients aged above 40 years, toothbrush users, implant wearers, orthodontic appliances wearers were excluded from the study.

Statistical Analysis

Data analysis was conducted using IBM SPSS Statistics version 23.0 (IBM Inc., Chicago, IL, USA). Descriptive statistics (frequencies & percentage) were calculated, and the association between categories was assessed using the Chi-square test. Statistical significance was determined at p-value <0.05.

Ethical Consideration

The participants were instructed on the purpose of the study and informed written consent was obtained. The Institutional Review Board of Riyadh Elm University, IRB approval number "FUGRP/2020/153/101/132," was obtained.

Results

A total of 225 participants initially agreed to take part in the study. However, 25 did not complete the questionnaire due to time constraints and were dropped from the final data analysis. The response rate was 88.8%. A total of 200 participants were finalized in the study.

From among the 200 participants, most of them were males (n=129, 64.5%) than females (n=71,35.5%), aged between 20-40 years. The majority (n=151,75.5%) of the participants were higher educated, with post-graduation and graduation degrees, whereas lower educated participants had primary and high school degrees (n=49,24.5%). About 60% of the participants had jobs, and only 40% were unemployed. The demographic details of the participants are shown in Table 1.

	Characteristics	N	N%
Age Group	20-25 Years	70	35.0
	26-30 Years	47	23.5
	31-35 Years	26	13.0
	36-40 Years	57	28.5
Gender	Male	129	64.5
	Female	71	35.5
Marital Status	Single	101	50.5
	Married	92	46.0
	Divorced/ Widow	7	3.5

Education	No Education	1	.5
	Primary School	10	5.0
	High School	38	19.0
	Graduate	109	54.5
	Post Graduate	42	21.0
Occupation	Yes	120	60.0
	No	80	40.0

Table 1: Distribution of the Study Participants (n=200)

Distribution of Study Participants

The total number of non-smokers in our study was less (n=22, 11%) than the total number of smokers (n= 178, 89%). Among smokers, the practice of shisha smoking was reported high (n= 85, 42.5%) among the study participants than the electronic cigarettes (n=59, 29.5%) and dual smoking (n=34, 17%). (Figure 1).

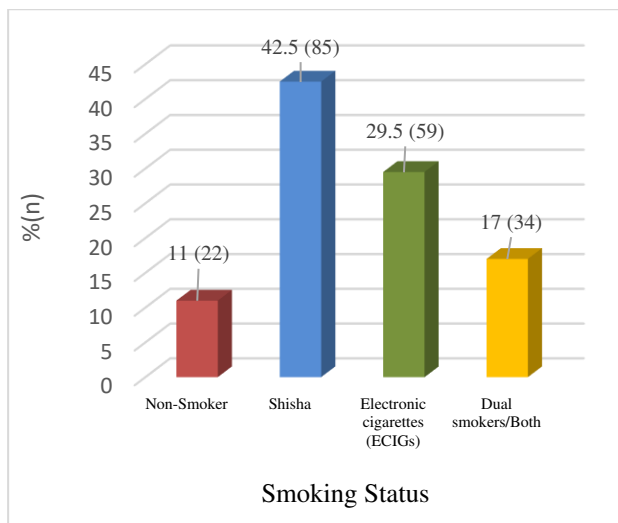


Figure 1: Distribution of the study participants based on the smoking status

The Education Level of Participants and Smoking Status

Overall, the majority (n=151,75.5%) of the participants were higher educated with post-graduation and graduation levels. Among 178 smokers, 73.02 % were higher educated, 35.39 % were shisha smokers, 23.59 % were ECIG smokers, and 14.04% were dual smokers. Among a total of 22 non-smokers, 95.45% had higher education.

Among a total of 151 higher educated smokers, the majority were shisha smokers (n=63) than ECIGs (n=42), and dual smokers (n=25), and the prevalence of shisha smoking among higher educated (graduation and post-graduation) participants was reported higher (41.72%) compared to ECIG (27.8%) and dual smoking (16%). The lower educated participants (primary and high school) showed a high prevalence of ECIG smoking (Table 2).

Educational Level	Non-Smoker		Shisha		ECIG		Dual smokers/Both	
	N	%	N	%	N	%	N	%
No Education	0	0	1	1.2	0		0	
Primary School	1	4.5	4	4.7	4	6.8	1	2.9
High School	0	0	17	20.0	13	22.0	8	23.5
Graduate	11	50	44	51.8	33	55.9	21	61.8
Post Graduate	10	45.5	19	22.4	9	15.3	4	11.8
Total	22	100	85	100.0	59	100.0	34	100.0

Chi square 16.114, P =0.186, NS- Non-significant (p>0.05)

Table 2. The Education Level of the Participants and Smoking Status

The Smoking Habit among Study Subjects

Duration of smoking for the majority (n=90, 50.5%) was from 1-2 years, for 20-30 minutes once a day, aged between 20-25 years (p <0.001). About 46% of smokers consumed

alone. For the statement "Do you share smoking with friends and family members," the response "No" was the highest, which was about 52.8% (n=94) than "Yes" (n=84, 47.1%). However, the majority (64.7%) of the dual smokers shared

smoking with families and friends. The reason for smoking was curiosity and to reduce stress. There was a significant difference between smokers of Shisha, ECIGs, and dual smokers regarding the responses (P< 0.001). Most of

(60.8%) of the smokers were interested in quitting smoking, whereas only 39.2% were not willing. About 85.3% were aware of tobacco cessation centers (Table 3).

Practice	Responses	SHISHA		ECIGs		Dual smokers		χ^2	P
		N	%	N	%	N	%		
1. At what age you initiated smoking? (in years)	10-20	17	20.0	14	23.7	11	32.4	200.570	<0.001**
	20-25	42	49.4	33	55.9	17	50.0		
	26-30	16	18.8	11	18.6	2	5.9		
	31-35	10	11.8	1	1.7	4	11.8		
2. Duration of smoking habit (in years)	1-2	47	55.3	31	52.5	12	35.3	211.945	<0.001**
	3-4	14	16.5	21	35.6	14	41.2		
	4-5	0	0.0	1	1.7	0	0.0		
	5-6	16	18.8	6	10.2	4	11.8		
	>10	8	9.4	0	0.0	4	11.8		
3. Daily frequency of smoking?	Once	44	51.8	10	16.9	8	23.5	235.708	<0.001**
	Twice	19	22.4	9	15.3	5	14.7		
	Thrice	14	16.5	11	18.6	5	14.7		
	Four times	2	2.4	7	11.9	7	20.6		
	Five or more	6	7.1	22	37.3	9	26.5		
4. Duration of a smoking in a day?	20-30 min	46	54.1	35	59.3	20	58.8	186.525	<0.001**
	30-40 min	12	14.1	5	8.5	4	11.8		
	40-50 min	9	10.6	2	3.4	1	2.9		
	1-2 hours	15	17.6	13	22.0	7	20.6		
	> 2 hours	3	3.5	4	6.8	2	5.9		
5. Share your smoking with others such as friends and family members?	Yes	34	40.0	28	47.5	22	64.7	23.99	<0.001**
	No	51	60.0	31	52.5	12	35.3		
6. Why do you smoke?	Decrease stress	24	28.2	20	33.9	8	23.5	196.264	<0.001**
	Friends influence	17	20.0	9	15.3	10	29.4		
	Curiosity	39	45.9	26	44.1	14	41.2		
	Pleasure	0	0.0	1	1.7	1	2.9		
	Family Influence	5	5.9	3	5.1	1	2.9		
7. With whom do you share smoking?	Alone	38	44.7	34	57.6	10	29.4	188.278	<0.001**
	Friends	33	38.8	17	28.8	18	52.9		
	Family	14	16.5	8	13.6	6	17.6		
8. Do you know that there are tobacco smoking habit cessation centers?	Yes	74	87.1	49	83.1	29	85.3	0.635	0.888 NS
	No	11	12.9	10	16.9	5	14.7		
9. Do you like to quit/stop smoking habit?	Yes	54	63.5	39	66.1	15	44.1	1.395	0.707 NS
	No	31	36.5	20	33.9	19	55.9		

Table 3: Smoking Habits Related to Variables among Study Participants

**-Highly significant (p<0.001), *- Significant (p<0.05), NS- Non-significant (p>0.05)

Assessment of Knowledge on the Effects of Smoking on Oral Health

There were five questions related to knowledge and five related to awareness in the questionnaire. The response to the statement "Do you know the bad effects of smoking on oral health?" was "Yes" among 68.2% of the non-smokers and 62.3% of smokers, whereas 41.5% of smokers were not aware. Non-smokers (n=21, 95.5%) had more knowledge than smokers (n=113, 63.4%) about the statement that smoking causes oral cancer.

The majority of Shisha (n=57, 67.1%) and dual smokers (67.6%) agreed that smoking causes oral cancer. However, 44% of ECIG smokers disagreed with it (P=0.010). Smoking causes bad breath was known to 86.4% of non-smokers, and 76.4% of smokers; mostly, Shisha smokers (n=73, 85.9%) were aware that smoking causes bad breath (P= 0.001). The statement that "smoking causes infectious diseases such as Tuberculosis, herpes ulcers and hepatitis C on sharing with others" was agreed by 91(51.1%) of smokers and 15 (68.2%) of non-smokers, whereas 48.8% of smokers disagreed with it. (Table 4).

Knowledge	Responses	SHISHA		ECIGs		Dual smokers		Non-Smoker		χ^2	P
		N	%	N	%	N	%	N	%		
10. Do you know the bad effects of smoking on oral health?	Yes	56	65.9	36	61.0	19	55.9	15	68.2	1.39 5	0.707 NS
	No	29	34.1	23	39.0	15	44.1	7	31.8		
	Total	85	100	59	100.0	34	100	22	100.		
	Total	85	100	59	100.0	34	100	22	100.0		
11. Do you know smoking causes oral cancer?	Yes	57	67.1	33	55.9	23	67.6	21	95.5	11.3 32	0.010 *
	No	28	32.9	26	44.1	11	32.4	1	4.5		
	Total	85	100	59	100.0	34	100	22	100.0		
12. Do you know that sharing of smoking causes infectious diseases like tuberculosis (TB), herpes ulcers and hepatitis C?	Yes	42	49.4	33	55.9	16	47.1	15	68.2	3.16 0	0.368 NS
	No	43	50.6	26	44.1	18	52.9	7	31.8		
	Total	85	100	59	100	34	100	22	100		
13. Does smoking causes dry mouth?	Yes	49	57.6	40	67.8	25	73.5	18	81.8	6.04 0	0.110 NS
	No	36	42.4	19	32.2	9	26.5	4	18.2		
	Total	85	100	59	100.0	34	100	22	100.0		
14. Does smoking causes bad breathe in mouth?	Yes	73	85.9	35	59.3	28	82.4	19	86.4	16.0 56	0.001 *
	No	12	14.1	24	40.7	6	17.6	3	13.6		
	Total	85	100	59	100.0	34	100	22	100.0		

Table 4. Assessment of the Knowledge on the Effects of Smoking on Oral Health among Smokers and Non-smokers

** Highly significant (p<0.001), *- Significant (p<0.05), NS- Non- significant (p>0.05)

Assessment of the Effects of Smoking on Oral Health

Statements on the awareness of smoking effects include caries, stains, and mobility of teeth, gum bleeding, and white-coated tongue. About 94% of dual smokers and 86.4% awareness of effects of smoking on oral health showed that ECIG smokers were more aware than Shisha smokers of the statement that smoking causes stains on teeth (P<0.001). The majority of the smokers (n=103, 57.8%) were not aware that

smoking causes bleeding from gums (P=0.042), and 76.5% of Shisha smokers were not aware that smoking causes white-coated tongue, whereas, ECIGs and dual smokers (86.4% & 94.1% respectively) were aware of it (P<0.001). The majority of dual and Shisha (61.8% and 58.8%) smokers were aware that smoking causes the mobility of teeth (P=0.008) (Table 5).

Awareness	Responses	SHISHA		ECIG		Both		Non-Smoker		χ^2	P
		N	%	N	%	N	%	N	%		
15. Are you aware that smoking causes caries?	Yes	66	77.6	38	64.4	22	64.7	21	95.5	10.049	0.018*
	No	19	22.4	21	35.6	12	35.3	1	4.5		
	Total	85	100.0	59	100.0	34	100.0	22	100.0		
16. Are you aware that smoking causes stains on teeth?	Yes	20	23.5	51	86.4	32	94.1	18	81.8	85.492	<0.001**
	No	65	76.5	8	13.6	2	5.9	4	18.2		
	Total	85	100.0	59	100.0	34	100.0	22	100.0		
17. Are you aware that smoking causes the mobility of teeth?	Yes	50	58.8	29	49.2	21	61.8	20	90.9	11.743	0.008*
	No	35	41.2	30	50.8	13	38.2	2	9.1		
	Total	85	100.0	59	100.0	34	100.0	22	100.0		
18. Are you aware that smoking causes gum bleeding?	Yes	33	38.8	26	44.1	16	47.1	16	72.7	8.187	0.042*
	No	52	61.2	33	55.9	18	52.9	6	27.3		
	Total	85	100.0	59	100.0	34	100.0	22	100.0		
19. Are you aware that smoking causes white coated tongue?	Yes	20	23.5	51	86.4	32	94.1	17	77.3	83.519	<0.001**
	No	65	76.5	8	13.6	2	5.9	5	22.7		
	Total	85	100.0	59	100.0	34	100.0	22	100.0		

Table 5. Assessment of the Awareness of the Effects of Smoking on Oral Health

**-highly significant (p<0.001), *- Significant (p<0.05), NS- Non-significant (p>0.05)

Study participants with graduate and postgraduate education had higher knowledge and awareness of the effects of smoking on oral health. The various educational categories of the study participants have shown a significant association with the knowledge of harmful effects of smoking on oral health (p<0.001), smoking as cause of oral cancer (p<0.001), dry mouth (p<0.001), bad smell / bad breath (p<0.001) and infectious diseases like tuberculosis (TB), herpes ulcers and

hepatitis C (p<0.001). Similarly educational level showed significant difference in awareness of smoking causes caries (p<0.001), mobility of teeth (p<0.001), and gum bleeding (p<0.001). However, educational categories did not show any significant difference in awareness of smoking causes stains on teeth (p=0.304) and coated tongue (p=0.366), as shown in table 6.

Question	Responses	Primary school		High school		Graduates		Postgraduates		χ^2	P
		N	%	N	%	N	%	N	%		
Do you know the bad effects of smoking on oral health?	Yes	1	10.0	10	26.3	79	72.5	35	83.3	43.06	<0.001**
	No	9	90.0	28	73.7	30	27.5	7	16.7		
Do you know smoking causes oral cancer?	Yes	3	30.0	8	21.1	81	74.3	42	100.0	67.45	<0.001**
	No	7	70.0	30	78.9	28	25.7	0	0.0		
Do you know that sharing of smoking causes infectious diseases like tuberculosis (TB), herpes ulcers and hepatitis C?	Yes	1	10.0	6	15.8	61	56.0	38	90.5	53.70	<0.001**
	No	9	90.0	32	84.2	48	44.0	4	9.5		
Does smoking cause dry mouth?	Yes	1	10.0	17	44.7	74	67.9	40	95.2	39.70	<0.001**
	No	9	90.0	21	55.3	35	32.1	2	4.8		

Does smoking causes bad smell / bad breath in mouth?	Yes	2	20.0	25	65.8	91	83.5	37	88.1	30.12 9	<0.00 1**
	No	8	80.0	13	34.2	18	16.5	5	11.9		
Are you aware that smoking causes caries?	Yes	4	40.0	11	28.9	90	82.6	42	100.0	66.25 9	<0.00 1**
	No	6	60.0	27	71.1	19	17.4	0	0.0		
Are you aware that smoking causes stains on teeth?	Yes	5	50.0	20	52.6	72	66.1	24	57.1	3.632	0.304 NS
	No	6	60.0	18	47.4	37	33.9	18	42.9		
Are you aware that smoking causes mobility of teeth?	Yes	2	20.0	11	28.9	68	62.4	39	92.9	28.45 1	<0.00 1**
	No	8	80.0	27	71.1	41	37.6	3	7.1		
Are you aware that smoking causes gum bleeding?	Yes	8	80.0	6	15.8	47	43.1	30	71.4	24.11 4	<0.00 1**
	No	2	20.0	32	84.2	62	56.9	12	28.6		
Are you aware that smoking causes coated tongue?	Yes	4	40.0	20	52.6	71	65.1	24	57.1	3.171	0.366 NS
	No	6	60.0	18	47.4	38	34.9	18	42.9		

Table 6: Education Level and Knowledge and Awareness of smoking effects on oral health

Discussion

This study examined the understanding and comprehension of the consequences of smoking Shisha and ECIGs on oral health among smokers (178) and non-smokers (22), recruited from the dental hospital in Riyadh, Saudi Arabia.

Shisha smoking is on the rise among youth worldwide. It is a common practice in Arabic countries as well as some Asian ones. Although common throughout all age groups, it is particularly popular among teenagers. It often occurs among friends in social settings such as private residences or venues that offer ready-to-smoke Shisha to customers. Shisha smoking is a threat to both oral and general health of the public. It has been associated with adverse oral health outcomes.^{11, 12}

Several cross-sectional studies conducted in India had reported the association of Shisha smoking with several oral lesions.¹³ According to the studies in the United States,^{14, 15} electronic cigarette smokers are more likely white people with higher education and higher income status than conventional cigarette smokers. This finding is dissimilar to the current study, in which the majority (74.2%) of the higher educated smokers are Shisha smokers.

Our analysis is consistent with the findings of a study in Pakistan,¹⁶ regarding different forms of tobacco used by Shisha smokers reporting that smoking duration was 20-30 minutes among 58% of the Shisha smokers; however, it contradicts another study, which reported 15-30 minutes of smoking Shisha.¹⁷ Electronic cigarette smokers generally

believe that e-cigarettes are much healthier than conventional cigarettes and reduce or quit smoking. About 66.1% of ECIG smokers were willing to quit smoking in the present study, which was found consistent with the study of Rutten et al.¹⁸

Curiosity was the reason for smoking for most participants in the present study, which was also a common finding of other studies;¹⁶⁻¹⁹ however, it contradicts Malaysia's study reporting that friends and family influenced their smoking.²⁰

The risk of transmission of Hepatitis C is more among community practice of smoking because sharing the same mouthpiece between individuals with oral lesions can transmit the virus.²¹ This is similar to the present study in which the majority (50.6%) of the Shisha smokers were also not aware that communicable infectious diseases such as tuberculosis, hepatitis C, herpes, and influenza could be transmitted to others on sharing; however, it contradicts other studies which reported that the majority of the participants were aware.²²

Several cross-sectional studies conducted in Saudi Arabia reported that water-pipe smoking (Shisha) is associated with periodontal bone loss and teeth mobility.²³ About (58.8%) of Shisha smokers were aware in the present study. Bad breath and dry mouth are long-term effects of Shisha smoking, which were reported in a study by Zaatari et al. and were also agreed by the majority of Shisha smokers (85.9% & 57.6%) in the present study.²³

Compounds that bind to nucleic acids are potentially

carcinogenic. Tobacco is the most critical risk factor for oral cancer.²⁴ El-Hakim *et al.* found a positive correlation between lip, cheek, and mouth cancers (squamous cell carcinoma & keratoacanthoma) and Narghile smoking. Their research noted that Narghile tobacco is made up of a juicy ingredient that leads to chronic irritation, increasing susceptibility to malignancy of the mouth. In this study, the majority (67.6%) of dual smokers and Shisha smokers (67.1%) showed more knowledge and awareness than ECIGs smokers about the statement that smoking causes oral cancer.²⁵

Gingival bleeding and gums inflammation were more prevalent among Shisha and ECIG smokers in one of the studies.²⁶ This finding contradicts the present study in which the majority of the participants of Shisha (61.2%) and ECIGs smokers (55.9%) were not aware of it.

A study conducted in the UAE found that Shisha smokers showed stains, caries, bad breath, mobility of teeth, and dry mouth, that are consistent with the present study.²⁷

In one of the studies conducted in Saudi Arabia, the knowledge of smoking Shisha's adverse effects was found inadequate among university dental students.²⁸ It contradicts our present study, which reported that the knowledge and awareness of smoking's effects on oral health among higher educated smokers were found adequate than the lower educated ones.

Strengths and Limitations

Many studies were reported on Shisha and electronic cigarettes in other countries, but minimal information is available from Saudi Arabia, particularly on these products' oral health effects. Therefore, this study was one of its kind in Saudi Arabia which targets the Saudi population to assess their knowledge, awareness, and practice of Shisha, ECIGs, and dual smoking on oral health. On the other hand, this study's limitation is that it is an institution-based study targeted at a specific region or province population and is not representative of entire Saudi Arabia. Therefore, further studies should be done in multiple regions or provinces, involving different Saudi Arabian population.

Lack of awareness programs and policies controlling Shisha and ECIG smoking are the factors responsible for these products' popularity. Implementation of preventive programs highlighting the ill effects of Shisha and ECIG smoking on oral and systemic health among the Saudi Arabian population is highly recommended.

Conclusion

Overall, knowledge and awareness of non-smokers and smokers with higher education were found to be adequate compared to smokers with primary and high school levels of education. Among smokers, the knowledge of dual smokers was reported adequate than Shisha and ECIG ones. However, awareness was found inadequate among Shisha smokers than ECIG ones. The knowledge and awareness of postgraduate and graduate smokers were found more than primary and high school smokers. It was alarming to find that, despite higher education of the participants and good knowledge and awareness about the deleterious effects of smoking, the prevalence of smoking was high among dental patients seeking care at university dental clinics.

Financial Support: N/A

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Darkhor S, Estebarsari F, Hosseini M, Charati JY, Vasli P. Effect of health promotion intervention on Nurses' healthy lifestyle and health-promoting behaviors: RCT study. *J. Adv. Pharm. Educ. Res.* 2018;8(1):108-114.
2. Mathialagan AG, JA JA, Dinesh M, Azra N, Selvaganapathi G, Harikrishnan T, Kohila JR, Suriya PN, Fathy I, Ramalingam R, Vikneswaran S. Patient attitudes and health information features as predictors of health promotion in Malaysia. *J. Adv. Pharm. Educ. Res.* 2018;8(2):43-48
3. Algahtani FD. Healthy Lifestyle among Ha'il University Students, Saudi Arabia. *Int. J. Pharm. Res. Allied Sci.* 2020;9(1):160-167.
4. Hanawi SA, Saat NZ, Zulkafly M, Hazlenah H, Taibukahn NH, Yoganathan D, Abdul Rahim NN, Mohd Bashid NA, Abdul Aziz FA, Low FJ. Impact of a Healthy Lifestyle on the Psychological Well-being of University Students *Int. J. Pharm. Res. Allied Sci.* 2020 Apr 1;9(2):1-7.
5. Kadhum M, Abed Sweidan, A, Jaffery AE, Al-Saadi, Madden B. A review of the health effects of smoking shisha. *Clinical Medicine* 2015;15:263–266.
6. Aslam HM, Saleem S, German S, Qureshi WA. Harmful effects of Shisha: literature review. *International Archives of Medicine* 2014;7:1-9.
7. Akram Z, Al-Kheraif AA, Kellesarian SV, Vohra F, Javed F. Comparison of oral Candida carriage in water pipe smokers, cigarette smokers, and non-smokers. *Journal of Oral Science* 2018; 60:115-20.

8. Ramôa CP, Eissenberg T, Sahingur SE. Increasing Popularity of Waterpipe Tobacco Smoking and Electronic Cigarette Use: Implications for Oral Health Care. *J Periodontal Res.* 2017; 52: 813–23.
9. Chaffee BW. Electronic Cigarettes: Trends, Health Effects, and Advising Patients Amid Uncertainty. *J Calif Dent Assoc* 2019;47:85–92.
10. Mahboub B, Mohammad AB, Nahle A, Vats M, Al Assaf O, Al-Zarooni H. Analytical determination of nicotine and tar levels in various dokha and Shisha Tobacco Products. *Journal of Analytical Toxicology* 2018;42: 496–502.
11. Akl EA, Gaddam S, Gunukula SK, Honeine R, Jaoude PA, Irani J, et al. The effects of waterpipe tobacco smoking on health outcomes: A systematic review. *Int J Epidemiol.* 2010;39: 834–57.
12. Bibars ARM, Obeidat SR, Khader Y, Mahasneh AM, Khabour OF. The effect of waterpipe smoking on periodontal health. *Oral Health Prev Dent* 2015;13: 253–259.
13. Dangi J, Kinnunen TH, Zavras A. Challenges in global improvement of oral cancer outcomes: findings from rural Northern India. *TobInduc Dis* 2012; 10:5.
14. King BA, Alam S, Promoff G, Arrazola R, Dube SR. Awareness and ever- use of electronic cigarettes among U.S. adults, 2010–2011. *Nicotine Tob Res* 2013; 15:1623–1627.
15. Rose SW, Barker DC, D'Angelo H, Tamkeen K, Huang J, Chaloupka FJ et al. The availability of electronic cigarettes in U.S. retail outlets, 2012: results of two national studies. *Tob Control* 2014; 23:10–16.
16. Sameer RU, Sadiq MA, Parekh MA, Zubairi ABS, Frossard PM, Khan JA. A cross-sectional study identifying forms of tobacco used by shisha smokers in Pakistan. *JPMA* 2012; 62:1-11.
17. Qureshi A, Farooqui S, Qureshi H. A clinical analysis of impact of waterpipe smoking on periodontal ligament attachment loss. *JPDA* 2016; 25:26-31.
18. Rutten LJF, Blake KD, Agunwamba AA, Grana RA, Wilson PM, Ebbert JO et al. Use of E-cigarettes among current smokers: Associations among reasons for use, quit intentions and current tobacco use. *Nicotine and tobacco research* 2015; 1228-1234.
19. Javed F, Al-Kheraif AA, Rahman I, Millan-Luongo LT, Feng C, Yunker M, et al. Comparison of clinical and radiographic periodontal status between habitual waterpipe smokers and cigarette smokers. *J Periodontol* 2016; 87:142–147.
20. Wong LP, Haridah A, Agham moham17.med N, Aghazadeh, Hoe VCW. Shisha smoking practices, use reasons, attitudes, health, and intentions to quit among shisha smokers in Malaysia. *Int. J. Environ. Res. Public health.* 2016;13: 726-740.
21. Habib M, Mohamed MK, Abdel-Aziz F, et al. Hepatitis C virus infection in a community in the Nile Delta: risk factors for seropositivity. *Hepatology* 2001; 33:248-253.
22. Munckhof WJ, Konstantinos A, Wamsley M, et al. A cluster of tuberculosis associated with use of a marijuana water pipe. *Int J Tuberc Lung Dis* 2003; 7:860–765.
23. El-Zaatari ZM, Chami HA, Zaatari GS. Health effects associated with waterpipe smoking. *Tob Control* 2015;24:31-43.
24. Gupta, P.C., Murti, P.R., and Bhonsle, R.B. Epidemiology of cancer by tobacco products and significance of TSNA. *Crit. Rev. Toxicol* 1996; 26:183–198.
25. Hakim IE, Uthman MA. Squamous cell carcinoma and keratoacanthoma of the lower lip associated with "Goza" and "Shisha" smoking. *Int J Dermatol* 1999;38:108–110.
26. Ghahroudi AAR, Derakhshan B, Khorsand A, Shayesteh SY, Rokna A, Yaghobee S. Effect of Hubble-Bubble Smoking on Oral Health. *Bull. Env. Pharmacol. Life Sci.* 2014;3: 52-59.
27. Prasad P, Hamed M, Nahar P. Oral health effects of shisha smokers A study among Arabs and Indians in UAE Saudi. *J. Oral. Dental. Res* 2018; 3: 207-212.
28. Muzzamil D.S, Rethaiaa A.S, Mutairi A.S, AlRashidi H.A, Saad AAR. Prevalence and perception of shisha smoking among university students: A cross-sectional study. *J intsocprev community dent* 2019; 9: 275-281.

Corresponding Author

Nishath Sayed Abdul

Faculty of Oral Pathology, Department of OMFS and Diagnostic Sciences, Riyadh Elm University, P.O. Box 84891, Riyadh 11681, Kingdom of Saudi Arabia.

Email: nishathsayed @ riyyadh.edu.sa