

Original article

Oral Hygiene Status and Caries Experiences Among Smoker Male in Associated with Their Knowledge in Benghazi City, Libya.

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Abstract

Smoking has negative effects on health in general, and it is considered a risk factor for death. Much of the research evidence that smoking has a bad effect on oral health ranges from mild conditions to severe forms such as oral cancer. Smoking can also cause discoloration of teeth, periodontal disease, implant failure, and dental caries. Based on these research, oral health status among smoker people is necessary to evaluate. The study aims to evaluate the oral hygiene status and caries experiences among male smokers and oral health knowledge in Benghazi City, Libya. A descriptive, cross-sectional research design based on a structured close-end questionnaire and intra oral examination (DMFT and S-OHI) were carried out among smokers. The sample was chosen from the Specialized Oral and Dental Education Center in Benghazi City, Libya, using a pre-tested, self-administered questionnaire. The data was collected and analyzed by using SPSS software. Results: It was found that more than half of the 57% of smokers are more than 35 years old. Regarding educational level, 27% of the sample had elementary level education, and 37% were college educated. Almost all of the males used cigarettes (84%), and about 55 % of the participants had poor oral hygiene. There were observed differences between the mean of caries experience and all sociodemographic data, but with simplified -oral hygiene index there were a significant association for educational level and seriocomic status only. Conclusion and Recommendations: concluded that high rates of the sample used cigarette type and half of them had poor oral hygiene status. Therefore, oral hygiene instructions should be given regularly to each smoker patient and encourage them to quit the habit of smoking. In addition, increased awareness of the roles of dentists in smoking cessation and prevention activities is needed in the dental healthcare setting of Libya.

Keywords. Smoker, Oral Health, Caries, Gingival Inflammation.

Introduction

Smoking has negative effects on health in general, and it is considered a risk factor for death. The annual estimated death rate due to smoking was 4.9 million persons, and this number is expected to increase to 10 million between the 2020^s and 2030^s [1,2]. There are many types of smoking, such as cigarette type, which is one of the most prevalent public health problems negatively influencing general and oral health. There are other types as: Electronic cigarettes (e-cigarettes or e-cigs) are designed to resemble real cigarettes. Chewing tobacco is a form of tobacco that is smokeless. It is usually used by taking a small portion and placing it between the gum and cheek inside the mouth. Chewing tobacco has to be chewed for flavors and nicotine to be released. Hookahs are water pipes used to smoke specially made tobacco that can be flavored [2,3]. Unhealthy lifestyle habits like tobacco use are a substantial determinant of oral health.

Many researchers' evidence that smoking has bad effects on oral health ranges from mild conditions to severe forms such as oral cancer. Also, smoking can cause discoloration of teeth, dentures, dental restorations, and alteration of taste and smell [4]. There is a clear and substantial body of evidence that demonstrates a strong relationship between the frequency of smoking and periodontal disease [5]. Non-smokers had more healthy periodontal tissues (increased percentage of healthy sextants) compared to smokers [6].

Moreover, dental caries is multifactorial diseases, many factors play role in on the progression of dental caries, smoking as a common risk factor to enhance bacterial growth and caries-susceptible environment by toxins, mucosal drying effects, high intraoral temperature, change in buffering capacity of saliva, alteration in the immune response altered resistance to microbial infections [7-9].

Oral cancer affects mostly middle-aged or elderly people. Cigarette smokers have a two to five times higher risk of oral cancer than of non-smokers, the risk increasing with the number of cigarettes and years smoked. On the other hand, cessation decreases the risk [10].

Based on this research, oral health changes among smokers' people are necessary to evaluate. In addition, it is important to make people aware of the relationship of smoking with potential oral health adverse effects [11]. Highly recommended to have a planned curriculum about the effects of tobacco use on oral health [12]. To our knowledge, only a few studies conducted in Libya focus on the smoking association with oral health changes. Although more research is required to assess this situation, the basic data that will be collected in our study is to evaluate oral hygiene status and caries experiences among male smokers in association with their knowledge in Benghazi City, Libya

Methods

Study design

A Cross-sectional survey was used to meet study objectives. The study included self-reported and clinical data collected by examination in dental units.

Sample collection

We distributed 130 questions among male patients. The sample participants were chosen from a public dental centre in Benghazi, a place that accommodates the largest number of samples, and a specialized Oral and Dental Education Center in Benghazi City.

Ethical considerations and approval

A formal letter addressed to Specialized Oral and Dental Education Center. Also, the approval was verbal without any official letter, as the researcher explained the purpose of the study to each participant to ensure their cooperation to achieve the task.

Calibration

Before the study began, examiners were trained and evaluated for agreement, intra-examiner reliability, and inter-examiner reliability, The questionnaire was pilot tested among males who were not included in the final data collection. A few amendments were performed on questions stems and answer options.

Implementation of study

The data of this research was collected from the first of January to March 2024. Each participant were interviewed to answer questions and examination.

Questionnaire design

A close-ended questionnaire was constructed following an intensive literature review on the subject [5,8-20]. The questionnaires addressed the following topics: The first sections assess the demographic data, such as age, educational level, and socioeconomic level. The second section is about types of smoking and knowledge-related questions, such as whether smoking increases the risk for dental caries and whether smoking affect people around you (negative smoking).

Clinical examination

The clinical dental examination was done by two examiners. It was conducted during time of work at department of diagnosis in the specialized Oral and Dental Education Center.

Pre-packed sterilized disposable oral examination kits, which contained a plastic plain mouth mirror, disposable probe, and sterilized gauze, were used. In addition, sterilized metallic WHO probes were used during the dental examination. Disposable gloves and masks were also used during the examination for each man to reduce the risk of cross-infection. Participants were examined for the detection of debris & calculus in the assessment of oral hygiene status and dental caries recorded the decayed, missed, and filled teeth index (DMFT) index by WHO diagnostic criteria [20].

The oral hygiene of participants was evaluated using the simplified Oral Hygiene Index (OHI-S) by Greene and Vermillion. This index has two components: the debris index (DI-S) and the calculus index (CI-S), and both these indices were measured on four posterior teeth and two anterior teeth. The DI-S and CI-S assessed for the OHI-S were examined on the labial surfaces of 11, 16, 26, and 31, and the lingual surfaces of 36 and 46.

The criteria for classifying debris are 0 = no debris on the tooth surface; 1 = soft debris covering not more than one-third of the tooth surface or presence of extrinsic stain without debris in the tooth surface; 2 = soft debris covering more than one-third, but not more than two-thirds, of the tooth surface; and 3 = soft debris covering more than two-thirds of the tooth surface. The debris scores are summed up and divided by the number of teeth scored to obtain the DI-S. At least two of the six teeth must have been examined to calculate the score. The same methods are used to obtain the CI-S. The DI-S and the CI-S are summed up to obtain the OHI –S.

Statistical analysis

Each questionnaire received an individual identification number to permit checking for any inconsistent responses. All questionnaires were collected, and the data was entered into the Microsoft office Excel 2021 database and checked for entry errors. The uncompleted questionnaires were excluded. After data entry, it was coded, analyzed, and tabulated.

The Statistical Package for Social Science version 28 (SPSS Inc. Chicago, IL, USA) was used for statistical analysis of the results. Descriptive statistics were displayed as percentages for qualitative and quantitative variables. Chi square and T-test were used for comparing data as appropriate. The level of significance was set at a P value equal to or less than 0.5.

Results

A total of 100 questionnaires (out of 130) were received, giving a response rate of 82.5%. About 30 questionnaires were excluded due to incomplete information. It found that more than half of 57% of the respondents were more than 35 years old. Regarding educational level, 37% were highly educated, and the majority of them had good income, according to socioeconomic status 78% (Table 1).

Table 1. Socio-demographic characteristics of participants

Variables	N	%
Age Group		
less than 35	43	43
more than 35	57	57
Educational level		
Elementary school	27	27.0
high school	36	36.0
college educated	37	37.0
Socioeconomic level		
Low income	17	17.0
Good income	78	78.0
High income	5	5.0

N: number, (%): percentage

The majority correctly identified that tobacco use is a risk factor for increased dental diseases, with a mean of 6.22 (SD, 5.95) (Table 2). Almost all of the males used cigarettes (84%), whereas 7%, 6%, and 3% of them used electrical cigarettes, Hookah, and chewing tobacco, respectively (Figure 1).

Table 2. Percentages of smokers regarding their knowledge about tobacco effects on oral health.

Variables	N	(%)	Mean	(SD)
Tobacco increases the risk for dental caries				
Yes	83	83.0	6.22	5.95
No	9	9.0	5.77	2.86
I Don't know	8	8.0	13.25	7.86
Smoking affects people surround you (negative smoking)				
I know	87	87.0	5.77	5.45
I don't know.	13	13.0	13.30	6.96
Smoking increases the risk for dental caries				
Yes	85	85.0	5.64	5.01
No	8	8.0	7.62	4.77
I Don't know	7	7.0	19.14	7.35
Stop smoking would reduce gingival inflammation				
Yes	80	80.0	6.26	5.84
No	7	7.0	7.00	5.74
I Don't know	13	13.0	9.61	7.93

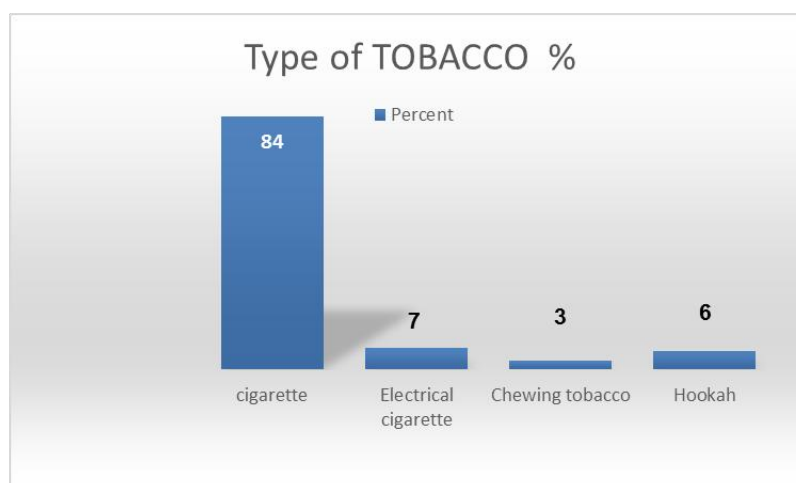


Figure 1. Display the types of tobacco.

Regarding oral hygiene status, 55 % of the participants had poor oral hygiene (Figure 2). Observed differences were statistically significant between the mean of caries experience and all sociodemographic data (mean of DMFT score). However, according to the simplified oral hygiene index (S-OHI) there was a significant association for educational level and socio-economic status (Table 3).

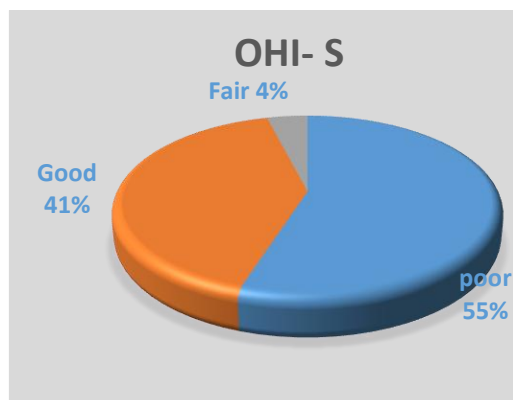


Figure 2. This is a figure Distribution the levels of simplified oral hygiene index (OHI-S)

Table 3. Sociodemographic data of participants associated with caries experience (DMFT score) and oral hygiene (Simplified oral hygiene index (OHI –S)

Variables	Mean ± SD	T – test	P –value
Age group DMFT score			
Less than 35	4.302 ± 3.51	- 3.648	0.000**
More than 35	8.596 ± 7.08		
OHI_S			
Less than 35	1.293 ± 1.16	- 0.373	0.710
More than 35	1.376 ± 1.05		
More than 35	1.307 ± 0.96		
Educational level DMFT score			
Elementary school	10.037 ± 6.38	8.195	0.001**
High school	6.972 ± 5.99		
College educated	4.135 ± 5.04		
OHI_S			
Elementary school	2.003 ± 0.088	11.485	0.000**
High school	1.402 ± 1.14		
College educated	0.795 ± 0.92		
Socioeconomic level DMFT score			
Poor	11.176 ± 4.92	6.792	0.001**
Well off	6.064 ± 6.15		
Rich	2.400 ± 1.34		
OHI_S			
Low income	2.458 ± 0.639	15.530	0.000**
Well off	1.163 ± 1.04		
High income	0.300 ± 0.42		

DMFT: Decayed, Missing and Filled Teeth index, N: number, (%): percentage, SD: standard deviation. * $p < 0.05$, obtained from chi-square test

Regarding the association between the knowledge's participants and means of simplified -oral hygiene index (S-OHI) there were a significant association with means of S-OHI and knowledge of participants. About 61.4% of those who had good oral hygiene indicated that smoking increases the risk for dental caries. Also, more than half of smokers 62.1% who had good OHI knew that smoking affects people around you (negative smoking) with statistical significance (Table 4).

Table 4. Knowledge of participant and associated oral hygiene status

Knowledge variable		OHI S			P- value
		Good	Fair	Poor	
Tobacco increases the risk for dental caries	incorrect	4 23.5%	12 70.6%	1 5.9%	0.016**
	correct	51 61.4%	29 34.9%	3 3.6%	
Smoking affects people around you (negative smoking)	incorrect	1 7.7%	11 84.6%	1 7.7%	0.001**
	correct	54 62.1%	30 34.5%	3 3.4%	
Smoking increases the risk for dental caries	incorrect	4 26.7%	10 66.7%	1 6.7%	0.057
	correct	51 60.0%	31 36.5%	3 3.5%	
Do you believe that stop smoking would reduce gingival inflammation	incorrect	8 40.0%	12 60.0%	0 0.0%	0.121
	correct	47 58.8%	29 36.3%	4 5.0%	

OHI_S: oral hygiene index, N: number, (%): percentage, * $p < 0.05$, obtained from chi-square test

A clear gradient was observed in the DMFT means across the category's knowledge of participants about that smoking affect people surround you (negative smoking) and smoking increases the risk for dental caries, with statistically significant with a mean of 5.7 (SD, 5.4), 5.6 (SD, 5.01) respectively (Table 5).

Table 5. Knowledge of participants and associated caries experiences (DMFT score).

Variables	DMFT score		T test	
	Mean	(SD)	t value	P value
Tobacco increases the risk for dental caries				
Incorrect	9.2941	6.78016	1.887	0.062
Correct	6.2289	5.95988		
Smoking affects the people around you (negative smoking)				
Incorrect	13.3077	6.96879	4.480	0.000**
Correct	5.7701	5.45105		
Smoking increases the risk for dental caries				
Incorrect	13.00	8.36660	4.675	0.000**
Correct	5.6471	5.01357		
Do you believe that stopping smoking would reduce gingival inflammation?				
Incorrect	8.7000	7.19722	1.590	0.115
Correct	6.2625	5.84774		

DMFT: Decayed, Missing and Filled Teeth index, N: number, (%): percentage, SD: standard deviation. * $p < 0.05$, obtained from chi square test

Discussion

Smoking has significant adverse effects on overall health, particularly oral health. The growing prevalence and popularity of modern tobacco and nicotine products have positioned tobacco use as a critical global public health concern. Smoking impacts oral health in various ways, from severe conditions like oral cancer to cosmetic issues such as tooth discoloration [1,2].

The present study was conducted to evaluate the oral health status of male smokers in Benghazi, Libya, as most female participants declined to participate. This is likely due to the prevailing societal perception that women should not smoke, as tobacco use among females is deemed socially unacceptable due to cultural and religious norms in Libya.

In this study, the majority of smokers were older than 35 years of age, aligning with the findings of another study [13]. Previous research indicated that smokers often had lower educational backgrounds, which was associated with limited awareness of the health risks posed by tobacco use [13,14]. However, our findings differed, as most participants (36%-37%) had completed high school or college education respectively. This finding aligns with a study conducted by *Beladenta Amalia et al* [15]., which revealed that smokers with

higher education levels tended to smoke more than those with lower education levels. This may be attributed to the higher socio-economic status of individuals with higher education levels. The correlation between education and tobacco use could be utilized in anti-smoking campaigns, as educated smokers might be more receptive to awareness programs.

In this study, participants reported higher consumption of cigarette products, while the prevalence rates for e-cigarette, hookah, and chewing tobacco use were 7%, 6%, and 3%, respectively. These findings contrast with estimates from Kuwait by *Ali Esmaeil*, who reported e-cigarette use at 26.4% and cigarette smoking at 25.1% [16]. This might be explained by the assumption that cigarettes are the main form of tobacco use.

However, many studies have found that smoking is associated with poor oral hygiene and more plaque buildup [117-19], which is consistent with the findings of our study. In this study, the majority of participants exhibited poor oral hygiene, with prevalence Simplified Oral Hygiene Index (OHI-S) being 55%. This finding can be attributed to several factors. Firstly, the side effects of smoking include xerostomia, tooth staining, and cervical caries. These conditions roughen the tooth surface, promoting greater plaque accumulation. Secondly, behavioral factors among smokers, such as less effective or less frequent oral hygiene practices, may also contribute to the observed poor oral hygiene.

The DMFT index is one of the simplest and widely used tools for assessing dental caries in epidemiological studies [20]. This study identified a significant association between DMFT values and age, with the index increasing as age advances. The highest DMFT levels were observed in adults aged 35 years and older, consistent with findings from previous research [21]. This can be explained by the increased exposure time associated with aging. As with increased age, there is a higher likelihood of having missing or filled teeth, which in turn reduces the probability of developing new dental caries lesions.

Furthermore, the present findings did not show a significant association between the DMFT index and the education level of participants. Typically, with an increase in education level, the mean number of decayed, missing, and filled teeth tends to decrease. This may be attributed to the superior socio-economic status often associated with individuals having a higher level of education, which may contribute to better access to dental care and oral health awareness. These results emphasize that education level could be a key factor in maintaining good dental health. Similar findings have been reported by *Boyko Bonev et al.* [22]. Furthermore, our study aligns with previous research suggesting that the DMFT index is influenced by various socio-demographic factors [23].

Our study revealed that participants had a good understanding of the fact that smoking increases the risk of dental caries. It was observed that DMFT index scores were significantly associated with smoking, as the study results showed an increase in the number of missing teeth and DMFT scores in line with smoking. In 2019, *Xue Jiang et al* [24] showed that smokers tend to have poor eating habits, pay less attention to oral self-care, rarely seek professional medical treatment, and exhibit poor compliance after treatment. A correlation between quitting smoking and improved oral health is evidenced by many research [9,12,19,22]. In the present study, it was observed that no statistical significance between the DMFT means stop and smoking would reduce gingival inflammation categories.

These findings underscore the importance of implementing preventive strategies for smokers by the oral health team. This includes improving awareness and knowledge about the negative impact of smoking on both oral and general health, organizing smoking cessation activities, and motivating individuals to quit smoking.

Conclusion

The present study concluded that high rates of the sample used cigarette type and half of them had poor oral hygiene status and severe gingivitis. It shows that smoking is associated with increased caries experience and poor oral hygiene. Therefore, oral hygiene instructions should be given regularly to each smoker patient and encourage them to quit the habit of smoking. In addition, increased awareness of the roles of dentists in smoking cessation and prevention activities is needed in the dental healthcare setting of Libya. They should not only check their patients' smoking habits to estimate the risk of disease progression and predictability of the therapy, but they should also help smokers improve their oral and systemic health by providing efficient and personalized smoking cessation counseling. Moreover, targeted cessation programs and mass media interventions can be helpful to motivate and educate smokers regarding the adverse effects of smoking on oral health.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported

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المستخلص

للتدخين آثار سلبية على الصحة بشكل عام، ويعتبر من عوامل الوفاة. تشير العديد من الأبحاث إلى أن للتدخين تأثيرًا سيئًا على صحة الفم يتراوح من حالة خفيفة إلى حالة خطيرة مثل سرطان الفم. كما يمكن أن يسبب التدخين تغير لون الأسنان إلى اللون البني/الأسود، وأطقم الأسنان، وترميمات الأسنان، وتغير الطعم والرائحة، وداء المبيضات الفموي، وأمراض اللثة، وفشل زراعة الأسنان، وتسوس الأسنان. وبناءً على هذه الأبحاث، من الضروري تقييم حالة صحة الفم بين المدخنين. تهدف هذه الدراسة إلى تقييم حالة نظافة الفم وتجارب التسوس بين الذكور المدخنين وصحة الفم ومعارفهم في مدينة بنغازي، ليبيا. تم إجراء تصميم بحثي وصفي مقطعي يعتمد على استبيانات مغلقة وفحص داخل الفم باستخدام مؤشرات (DMFT . OHI) بين المدخنين وتم اختيار العينة من المركز المتخصص لتعليم الفم والأسنان في بنغازي. المدينة. ليبيا. باستخدام استبيان تم اختياره مسبقًا وإدارته ذاتيًا. وتم جمع البيانات وتحليلها باستخدام برنامج SPSS. تبين أن 57% من أفراد العينة المدخنين كانت أعمارهم أكثر من 35 سنة. أما على المستوى التعليمي فقد وجد أن 27% من أفراد العينة حصلوا على مستوى ابتدائي و37% حصلوا على تعليم جامعي. أغلب الذكور استخدموا السجائر (84%). حوالي 55% من المشاركين كانوا يعانون من التهاب اللثة وهناك علاقة بين التسوس ومستوي التعليمي والمعيشي للمرضي. خلصت الدراسة الحالية إلى أن معدلات عالية من العينة تستخدم نوع السجائر ونصفهم يعانون من سوء حالة نظافة الفم والتهاب اللثة الحاد. ولذلك يجب إعطاء تعليمات نظافة الفم بانتظام لكل المرضى المدخنين وتشجيعهم على الإقلاع عن عادة التدخين. بالإضافة إلى ذلك، هناك حاجة إلى زيادة الوعي بأدوار أطباء الأسنان في أنشطة الإقلاع عن التدخين والوقاية منه في مجال الرعاية الصحية لطب الأسنان في ليبيا.