ORIGINAL ARTICLE

A comparative study of the oral hygiene status of smokers and non-smokers in Ibadan, Oyo state

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ABSTRACT

Aims: The aim of this study was to assess the effect of tobacco smoking on gingival health and the oral hygiene status of respondents. **Materials and Methods:** A cross-sectional survey of 213 adults from three communities in the Ibadan North local government was carried out. Respondents were divided into two groups comprising of 117 smokers (cases) and 96 non-smokers (control). Intra oral examination was done using the Simplified Oral Hygiene Index (OHI-S) and Gingival index (GI). **Results:** The mean age of the smokers was 31.2 ± 12.6 years and that of the non-smokers 32.8 ± 9.5 years. The mean Simplified Oral Hygiene Index (OHI-S) was 1.15 ± 0.51 for the non-smokers and 2.19 ± 0.62 for the smokers ($P < 0.05$). The mean GI was 1.06 ± 0.55 for the non-smokers and 1.62 ± 0.58 for the smokers ($P < 0.05$). **Conclusion:** The study shows that smoking is associated with increased severity of gingival disease. It is, therefore, recommended that smokers should be encouraged to visit a dentist for preventive procedure more regularly than the non-smokers and better still, smokers should be encouraged to quit smoking as gingival disease is not without consequences if allowed to persist.

Key words: Cigarette smoking, dental, gingivitis, gingiva, oral hygiene status, periodontal, smokers, status

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INTRODUCTION

Periodontal disease is defined as any pathological process affecting the periodontal tissue.[1,2] It almost invariably refers to inflammatory diseases affecting the marginal periodontal tissue namely gingivitis and periodontitis. The primary aetiological factor in periodontal disease is said to be bacterial plaque, which accumulates at the dento-gingival junction.[1,2] Gingivitis is widespread, but advanced periodontitis is limited to relatively small subgroups of the population.[3,4] The contribution of risk factors to the initiation and progression of periodontal disease has received considerable attention in the recent literature.[5-7] One of the risk factors that had been associated with increased prevalence of periodontal disease is the use of tobacco, especially cigarette smoking. However, the results of studies about the association between smoking and periodontal disease have been equivocal. Several studies have shown an increased plaque accumulation in relation to smoking,[8-12] while some other studies reported a slight decrease in dental plaque formation in smokers.[13-15] A higher incidence of gingivitis has also been found in smokers,[16,17] while others have suggested that there is no difference in gingival inflammation between smokers and non-smokers.[18] Some other studies have also concluded that signs of gingival inflammation are less obvious in smokers than non-smokers, which the authors attributed to the increased gingival keratinisation that is seen in smokers.[11,19,20] Nwhator *et al*., reported that smokers had less tendency to bleed on probing in comparison with their non-smoking counterparts.[11] There appears to be insufficient evidence to support a consistent association between smokeless tobacco and periodontal diseases, but Robertson *et al*.,[21] reported that oral sites where smokeless tobacco is used are at a major risk for mucosal lesions, gingival recession and attachment loss. However, there has been paucity of information on the effect of smoking on the periodontium in this environment.

This study, therefore, sought to investigate the effect of smoking on the periodontal tissues of Nigerians especially since most of the previous studies were done among the Caucasians. This became important as Nigerians have different socio-cultural beliefs and practices from the Caucasians where previous studies had been conducted.

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MATERIALS AND METHODS

The study was carried out in three designated indigenous communities, namely Sabo, Ekotedo and Oke-Seni all in Ibadan North local government area of Oyo State, Nigeria. Preliminary visits were made to the community leaders to seek their permission for the study and to familiarise with the study respondents in the areas and those visited include the chiefs and the Imams. Following the agreement of the leadership of the areas under study, a random selection of household in the area was done to identify current smokers, which was done by asking them the question whether they currently smoke or not. Cessation for at least a year was considered as non-smoking. These communities are similar and contiguous, providing a cluster of smokers in the same environment. After the procedures have been explained to the participants, informed consents were obtained from all those that agreed to participate in the study.

Data was collected using a 21 item questionnaire, which sought to assess the demographic characteristics of the participants, whether or not they are smoking cigarette and the average number of cigarette taking per day. Other questions asked included their dental practice, which included the frequency of tooth-brushing, what they used in cleaning their teeth and the utilisation of the dental care services. An intra-oral examination was then done by one of the authors (MO) to assess the oral hygiene status of the respondents using the Simplified Oral Hygiene Index[22] (OHI-S) and the gingival inflammation was assessed using the Gingival Index[23] (GI). All the first molars and the upper right and the lower left central incisors were used as index teeth for both GI and OHI-S. Recording of the data was done by a research assistant directly on the examiner-administered questionnaire. Respondents were later grouped into different socio-economic classes as classified by Famuyiwa *et al*.[24]

Socio-economic classification[24]

Social class I: Executive Managers, company directors, Professionals.
Social class II: Civil Servants, Nurses, Teachers including University Lecturers
Social class III: Semi-skilled (Tailors, Bricklayers, Carpenters etc).
Social class IV: Unskilled (Messengers, Road-side traders etc).

Statistical analysis

Data were entered into a personal computer and analysed using the Statistical Package for Social Sciences (SPSS). Analysis included frequency and calculation of means for quantitative values. T-test was used to compare the means of values and Chi-square tests were used for the categorical data. Pearson correlation was used to test the relationship of the indices. To adjust for the effect of confounders, analysis of covariance was employed.

RESULTS

A total of 213 participants, comprising of 96 (45.1%) non-smokers (control) and 117 (54.9%) smokers (cases), consented to take part in the study. One hundred and ninety-one (89.7%) of them were males, out of which 113 currently smoke cigarette and the remaining 22 (10.3%) were females, with only four smokers among them. There were significantly more male than female smokers ($P < 0.05$) [Table 1]. The age distribution of the respondents ranged from 14 years to 68 years, with a mean of 31.9 ± 11.3 years. In the population studied, 122 (57.3%) were younger than 30 years of age and the remaining 91 (42.7%) were older than 30 years of age [Table 1].

There were more subjects in the smokers group in the less than 30 years age group than in the non-smokers group. These differences were statistically significant ($X^2 = 13.635$, $P < 0.05$). Table 2 shows the socio-economic status of the respondents. Two of the non-smokers belong to the highest socio-economic class. There were also more subjects among the non-smokers in social class II, when compared to smokers (14/8). However, majority of the respondents were found in the social class IV or unskilled workers (58.7%).

Table 3 shows the past smoking history of respondents. Twenty-nine (30.2%) of the non-smokers have smoked before but have now stopped smoking, while all the smokers are still smoking actively. The mean OHI-S was 1.15 ± 0.51 for the non-smokers and 2.19 ± 0.62 for the

Table 1: Age and sex distribution of respondents according to their smoking status

	Age groups (%)		Gender (%)		Total (%)
	<30	>30	Male	Female	
Smoking status					
Non-smokers	50 (52.1)	46 (47.9)	78 (81.2)	18 (18.8)	96 (100)
Smokers	72 (61.5)	45 (38.5)	113 (96.6)	4 (3.4)	117 (100)
Total	122 (100)	91 (100)	191 (100)	22 (100)	213 (100)

Table 2: Occupational status of respondents according to their smoking status

Occupational status	Non-smokers (%)	Smokers (%)	Total (%)
Executive managers, Company Directors, Professionals	2 (2.1)	0	2 (0.9)
Civil servants, nurses, teachers	14 (14.6)	8 (6.9)	22 (10.3)
Semi-skilled	24 (25.0)	17 (14.5)	41 (19.3)
Unskilled (Messengers)	44 (45.8)	81 (69.2)	125 (58.7)
Students/Unemployed	12 (12.5)	11 (9.4)	23 (10.8)
Total	96 (100)	117 (100)	213 (100)

smokers. The non-smokers had a statistically significantly better oral hygiene than the non-smokers ($P < 0.05$). Likewise, the GI was poorer in the smokers than in the non-smokers. This difference was found to be statistically significant ($P = 0.000$) [Table 4]. Correlation of the indices showed that OHI-S was positively correlated with GI (0.647).

In order to adjust for the effect of variables such as sex, occupation and age of the respondents, univariate analysis of variance was employed. The effect of smoking on OHI-S was found to still be highly significant ($P = 0.000$), while the other independent variables, age, sex and occupation, were not. Similarly, when the effect of possible confounders like sex, age and occupation was adjusted for, by doing univariate analysis of variance, the effect of smoking on GI was still highly significant ($P < 0.05$). Age had a statistically significant association with GI ($P = 0.026$) though not as strong as of smoking.

Table 3: Past history of smoking

	Non-smokers (%)	Smokers (%)	Total (%)
Past history of smoking			
Yes	29 (30.2)	117 (100)	146 (68.5)
No	67 (69.8)	0	67 (31.5)
Total	96 (100)	117 (100)	213 (100)

X^2=119.12, df=1, [*P*=0.00]

Table 4: Comparison of the mean values of oral hygiene indices according to their smoking status

Smoking status	Mean±SD	*T*	*P*
Oral Hygiene Index			
OHI-S			
Non-smokers	1.152±0.51	–13.09	0.000
Smokers	2.191±0.62		
GI			
Non-smokers	1.061±0.55	–7.20	0.000
Smokers	1.623±0.57		

OHI – Oral hygiene index; GI – Gingival index

DISCUSSION

These data relate information on the oral hygiene indices to smoking habits. Cigarette smoking was based on self report by the respondents and it is not impossible that some smokers may deny they smoke. Many of the smoking histories were complex and limited by problems of recall and memory, such as non-smokers who formerly smoked, or quitters who later resumed and then sometimes quit again. For the purpose of this study, and to simplify the problem, a non-smoker was classified as one who currently has not been smoking for at least one year prior to the commencement of the study. This was adopted for simplification reason as many of the respondents could not recall clearly when they stopped smoking and had limited education.

The respondents were from the same environment and as such had similar socio-demographic characteristics especially occupation/socio-demographic class. There were, however, more males in the subject population than females, which was due to the fact that majority of the women did not consent to participate in the study. Majority of the women that declined to participate in the study opined that since the study directly relate to smoking habit, that it was not relevant to women. Two of the non-smokers belonged to the socio-economic class I and there were also more subjects in the non-smokers in occupational class II when compared to smokers. It may, therefore, be concluded that the higher the socio-economic status, the lower the prevalence of smoking habit in the group of subjects [Table 2]. It could be presumed that those in the higher socio-economic classes are better informed about the health implication of smoking, which might be responsible for why fewer numbers of those in these socio-economic classes tend to smoke.

The mean OHI-S was higher in the smokers, which shows that smokers generally had poorer oral hygiene than the non-smokers. This finding is similar to that of previous studies[8-12] where it was reported that the mean OHI score was higher among smokers compared with the non-smokers. This finding can be explained by the fact that cigarette smoking causes staining of teeth, which roughens the surface of the teeth and encourages more rapid plaque accumulation. However, there are some contrary studies that reported that smokers do not necessarily have poorer oral hygiene in comparison with their non-smoking counterparts.[13-15] Alexander[13] reported that accumulation of bacterial plaque was not associated with tobacco smoking among a group of students, a report that was corroborated by the report of Bastiaan and Waite[14] among young adults. The contrary findings of this study could have been due to the fact that majority of the respondents were in the lowest socio-economic classes and had little education in comparison with the students studied by Alexander.[13] Poorer health generally had been associated with those in the lower socio-economic classes compared with those in the higher class.[25,26] Gingival inflammation as measured by GI of Löe and Silness[23] was found to be higher in the smokers. This finding is in agreement with previous reports.[10,27] It is, however, contrary to the report by Skaleric and Kovac-Kavcic,[28] who reported that smokers have same or less gingival inflammation than non-smokers. The higher degree of inflammation seen in the smokers in this study could have been because of their poorer oral hygiene in comparison with the non-smokers. However, the comparison of smokers and non-smokers with similar level of oral hygiene have been studied with the finding that smoking *per se* has a marginal but significantly harmful effect on the periodontal tissue.[17] The gingivitis noted in the

study by Skaleric and Kovac-Kavcic,[28] was attributed to reduced gingival blood flow produced by nicotine in smokers. Tobacco smoke contains cytotoxic substances such as nicotine, which may be acquired by soft tissue absorption in the oral cavity, by adherence to tooth structures or in the blood stream.[29,30] These substances may initiate and/or worsen periodontal diseases. Tobacco by-products have been shown to affect cell behaviour in culture. Cotinine is a tobacco by-product and it has been measured in saliva,[31] plasma[32] and urine[33] of smokers. The presence of cotinine and nicotine in saliva and crevicular fluid of smokers may have a profound effect on the tissue destruction seen in periodontal disease.

The two indices used in this study (OHI-S and GI) were statistically significantly higher in the smokers. Since there were also statistically significant differences between smokers and non-smokers as regards sex, age and occupation, these variables could act as confounders on the effect of smoking on the indices. Therefore, the effects of these variables were adjusted for by analysis of variance. Even after the adjustment, smoking was still found to be highly associated with OHI-S and GI. This study concludes that smoking habits is deleterious to oral health. Detailed oral hygiene instructions should therefore be targeted at smokers and smokers should be encouraged to quit the habit.

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