Periodontal Disease Status of an Adult Population in a Nigerian Rural Community

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ABSTRACT

Objective: To assess the periodontal status of a Nigerian rural dwelling adult population as well as factors associated with the occurrence.

Methods: A cross-sectional descriptive study. Data on socio-demographic characteristics, oral self-care practices and social habits were collected with interviewer-administered questionnaires. Normative assessment of periodontal status was done according to the World Health Organisation Oral Health Survey criteria. Data was analysed for descriptive and inferential statistics using Chi-square, Fisher's Exact and logistic regression tests at 95% confidence interval and test for significance set at ($p<0.05$).

Results: The mean age (± SD) of the 490 study participants was 36.1 ± 15.8 with male 258 (52.7%) and female 232 (47.3%). Nearly all participants, 461 (94.1%) used toothbrush and paste for mouth cleaning. Frequency of once daily mouth cleaning was 60.2% and 31.4% of the participants were habitual users of alcohol and tobacco. Prevalence of gingivitis and periodontitis was 62.2% and 37.3% respectively. The prevalence of periodontal disease increased with older age and lower educational attainment ($p=<0.001$). Participants who used chewing stick as tooth cleaning material were 8.5 times more likely to have periodontitis than those who used toothbrush and paste (OR=8.5, 95% CI: 1.247 - 57.931, p=0.029).

Conclusion: The prevalence of periodontal disease was high indicating that the prevalence has not changed over the years in Nigeria. However, oral self-care practices were below optimal. There is a need for intervention through health promotion with special attention to older adults and persons with lower educational attainment to improve oral self-care practices and periodontal health in this group.

Keywords: Periodontal disease, adults, rural community

Received: 12th November, 2021.
Revision: 25th November, 2021.
Accepted: 13th December, 2021

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Citation: Nnawuihe UC, Sofola OO, Okeigbemen SA. Periodontal disease status of an adult population in a Nigerian rural community. Nig J Periodontal Res 2022; 3(1):12-18.

CLINICAL IMPLICATIONS

There is the need to strengthen the oral health system available in rural Nigerian communities to enhance oral health services and surveillance as the prevalence of periodontal disease is high. Interventions designed to improve periodontal health in adults in rural settings should incorporate health education on oral self-care practices including appropriate use of chewing sticks, toothbrush and toothpaste, tobacco and alcohol control as well as scaling. Furthermore, elderly and individuals with lower educational attainment should be treated as special groups as they are more at risk to periodontal disease.

INTRODUCTION

Periodontal disease is a type of oral disease which affects the periodontum.[1] It presents in its early stage as gingivitis.[1] Gingivitis is associated with gingival bleeding and can be reversed with improved oral hygiene.[1] Periodontitis is the late and irreversible stage of periodontal disease.[1] It is characterised by periodontal pockets.[1] In the scale of oral diseases globally, periodontal disease ranks second and is responsible for yearly loss of 54 billion US dollars in economic productivity.[1,2] It is also a major contributor to the global cost of treatment for oral diseases which is estimated at 442 billion US dollars yearly.[2] These figures are expected to rise in the future due to increasing retention of natural teeth and aging population.[2] In affected individuals, periodontal disease negatively impacts on the quality of life.[3] Alteration in food choices due to inefficient masticatory capacity and tooth loss, orofacial infections, increased risk to compromised systemic health, poor dental aesthetics, facial profile and self-confidence in social interactions are frequently documented sequelae of untreated periodontal disease.[1,2,3]

Some socio-demographic variables, oral self-care practices and social habits have been reported to be associated with the occurrence of periodontal disease.[1] Younger age groups are associated with lower prevalence of periodontitis and loss of periodontal attachment.[4] Males have been reported to have higher prevalence of gingivitis than females when puberty and pregnancy as confounding factors were excluded.[5] Higher educational attainment is associated with better periodontal health.[1,6] Suboptimal oral hygiene practices, habitual users of alcohol and tobacco are at increased risk having periodontal disease than non-users.[2]

According to Balogun *et al.*,[7] the risk of occurrence of common oral diseases is high in Nigerian rural communities due to factors such as low oral health awareness and behavioural practices unfavourable to oral health. Another major factor is poor access to oral health care caused by grossly insufficient oral healthcare facilities and manpower.[7,8] Despite this observation, a majority of data on periodontal disease in Nigerian population are derived from school-based, clinic-based, urban and semi-urban communities' studies.[1,3,4,9,10] School-based studies focus on children and young adults while most clinic-based and urban community studies focus on the elderly.[3,9,10] Consequently, there is a dearth of data about periodontal disease in Nigerian rural communities. There is a need to improve this situation as availability of adequate data will facilitate a better understanding of the scale of periodontal disease, possible advocacy and planning for oral health interventional programmes in Nigerian rural communities. Taking this in consideration, the objective of this study was to assess the periodontal status of a Nigerian rural dwelling adult population as well as factors associated with the occurrence.

MATERIALS AND METHODS

The study was carried out in Udo, a rural community in Ovia South-West Local Government Area of Edo State, Southern Nigeria. Udo village is about forty (40) kilometres from Benin-City, Edo State capital with a projected population of 13,000.[11] It has a community primary school and a primary health care centre. The study was descriptive and cross-sectional in design. The sample size of 388 was determined from the projected population of Udo using the Yamane formula,[12] $n = N/ 1+ N (e)^2$ where n = the sample size, N = the projected population size of Udo rural community, e = acceptable sampling error at 95% confidence interval = 0.05.

To meet the sample size requirement, simple random sampling technique by balloting was used to randomly select 468 houses from a sampling frame of 521 residential houses in Udo. This approach was adopted because typically in every house with a household there is at least an adult living inside. Selected houses were visited by the dental team and adults living therein were examined if informed consent was obtained.

Interviewer-administered questionnaires were used to collect data on socio-demographic characteristics, oral self-care practices and social habits from study participants. Normative assessment of periodontal status was done according to the World Health Organisation Oral Health Survey criteria.[13] The periodontium was examined using a mouth mirror and a lightweight Community Periodontal Index (CPI) probe under natural light while observing standard precautions to avoid cross-infection. In the periodontal examination, each index tooth's circumference was examined using 'the walking round the sulcus' technique. Periodontal pocket depths were measured at mesio-, mid-, and disto-buccal; mesio, mid-, and disto-lingual/palatal sites of each examined tooth. The questionnaires were administered by 4 trained record clerks. The clinical examination was conducted by 2 trained and calibrated examiners, each assisted by a record clerk. The Cohen Kappa inter-examiner reliability score was 0.78 which is rated as excellent.[14] A pilot study was conducted among 46 adults who were not included in the study. Observations from the pilot study such as more adults being at home during the community market days were taken into consideration in execution of the main study.

Ethical approval was obtained from the Ethics and Research Committee, University of Benin Teaching Hospital, Benin-City, Edo State, Nigeria. Permission was obtained from the traditional ruling council of Udo rural community Edo State, Nigeria.

Data analysis

Age was grouped into 18 – 34 years, 35 – 64 years and ≥ 65 years. The CPI scores were grouped as follows; Code 0 = healthy periodontium, Codes 1 and 2 = gingivitis and Codes 3 and 4 = periodontitis. Data obtained were subjected to descriptive and inferential analysis using IBM SPSS version 25.0 (Armonk, NY: IBM Corporation, NY, USA).[15] Percentages were used to determine prevalence. Chi-square test, Fisher's Exact test and logistic regression were used to test for association at 95% confidence interval and test for significance set at ($p<0.05$).

RESULTS

A total of 490 adults participated in the study. The mean age (± SD) was 36.1 ± 15.8. The age distribution was from 18 to 92 years with the age group of 18-34 years representing 53.9% of the sample. Males were 258 (52.7%) and females 232 (47.3%). In educational attainment, 32.1%, 55.5% and 5.7% had primary, secondary and tertiary education. Normal periodontium, gingivitis and periodontitis were recorded in 2 (0.4%), 305 (62.2%) and 183 (37.4%) of the participants respectively. The association between periodontal status and socio-demographic characteristics showed that gingivitis and periodontitis were more common in older age groups than younger age groups. Participants with higher educational attainment had lower prevalence of gingivitis and periodontitis. Higher prevalence of periodontitis was recorded in males than females. However, the association between periodontal status and gender was not significant (Table 1).

Among the study participants, 295 (60.2%) cleaned their mouth once daily and 139 (28.4%) cleaned their mouth more than once daily. Nearly all 461 (94.1%) used toothbrush and paste as a tooth cleaning material. In social habits, 154 (31.4%) took alcohol habitually and the same participants also had tobacco habit. Periodontitis was significantly associated with type of tooth cleaning material used. Participants, who used chewing stick as a tooth cleaning material, took alcohol and used tobacco habitually recorded the highest prevalence of periodontitis (Table 2).

Over 50% of the participants in all the subgroups of each socio-demographic variable studied, cleaned their teeth once daily. Twice or more daily tooth cleaning was more among younger age groups, females and those with higher educational attainment (Table 3).

Logistic regression analysis to ascertain the effects of age, educational attainment and tooth cleaning material on the likelihood that participants have periodontitis is shown in table 4. The regression model was statistically significant, $X^2(3) = 187.534$, $p = < 0.001$. The model explained 46.6% (Nagelkerke R^2) of the variance in periodontitis and correctly classified 79.8% of cases. Participants who used chewing stick as tooth cleaning material were 8.5 times more likely to have periodontitis than those who used toothbrush and paste. Also, participants with lower educational attainment had increased likelihood of having periodontitis. Decreasing age was associated with a reduction in the likelihood of having periodontitis.

Table 1: Association between socio-demographic characteristics and periodontal status of participants

	Periodontal status			Total *n(%)*	p-value
	Healthy *n(%)*	Gingivitis *n(%)*	Periodontitis *n(%)*		
Age (years)					<0.001
18 – 34	1 (0.4)	235 (89.0)	28 (10.6)	264 (53.9)	
35 – 64	1 (0.5)	65 (34.9)	120 (64.5)	186 (38.0)	
≥ 65	0 (0.0)	5 (12.5)	35 (87.5)	40 (8.1)	
Gender					0.125
Male	1 (0.4)	151 (58.5)	106 (41.1)	258 (52.7)	
Female	1 (0.4)	154 (66.4)	77 (33.2)	232 (47.3)	
Educational attainment					<0.001
Non-formal	0 (0.0)	9 (27.3)	24 (72.7)	33 (6.7)	
Primary	0 (0.0)	81 (51.6)	76 (48.4)	157 (32.1)	
Secondary	2 (0.7)	198 (72.8)	72 (26.5)	272 (55.5)	
Tertiary	0 (0.0)	17 (60.7)	11 (39.3)	28 (5.7)	
Total	2 (0.4)	305 (62.2)	183 (37.4)	490 (100.0)	

Table 2: Association between oral self-care practices, social habits and periodontal status of participants

	Periodontal status			Total *n (%)*	p-value
	Healthy n *%)*	Gingivitis *n (%)*	Periodontitis *n (%)*		
Tooth cleaning frequency					0.126
<Once daily	0 (0.0)	42 (75.0)	14 (25.0)	56 (11.4)	
Once daily	2 (0.7)	173 (58.6)	120 (40.7)	295 (60.2)	
≥Twice daily	0 (0.0)	90 (64.7)	49 (35.3)	139 (28.4)	
Tooth cleaning material					0.002
Chewing stick	0 (0.0)	5 (22.7)	17 (77.3)	22 (28.4)	
Toothbrush and paste	2 (0.4)	295 (64.0)	164 (35.6)	461 (94.1)	
Charcoal	0 (0.0)	5 (71.4)	2 (28.6)	7 (1.4)	
Tobacco/ Alcohol habit					0.066
Yes	0 (0.0)	86 (55.8)	68 (44.2)	154 (31.4)	
No	2 (0.6)	219 (65.2)	115 (34.2)	336 (68.6)	
Total	2 (0.4)	305 (62.2)	183 (37.4)	490 (100.0)	

Table 3: Association between tooth cleaning frequency and socio-demographic factors

	Tooth cleaning frequency			Total *n(%)*	p-value
	<Once daily *n(%)*	Once daily *n(%)*	≥Twice daily *n(%)*		
Age (years)					0.011
18 – 34	39 (14.8)	151 (57.2)	74 (28.0)	264 (53.9)	
35 – 64	12 (6.5)	114 (61.3)	60 (32.3)	186 (38.0)	
≥ 65	5 (12.5)	30 (75.0)	5 (12.5)	40 (8.1)	
Gender					0.124
Male	34 (13.2)	160 (62.0)	64 (24.8)	258 (52.7)	
Female	22 (9.5)	135 (58.2)	75 (32.3)	232 (47.3)	
Educational attainment					0.052
Non-formal	5 (15.2)	23 (69.7)	5 (15.2)	33 (6.7)	
Primary	16 (10.2)	98 (62.4)	43 (27.4)	157 (32.1)	
Secondary	35 (12.9)	160 (58.8)	77 (28.3)	272 (55.5)	
Tertiary	0 (0.0)	14 (50.0)	14 (50.0)	28 (5.7)	
Total	56 (11.4)	295 (60.2)	139 (28.4)	490 (100.0)	

Table 4: Logistic regression analysis for the relationship between age, educational attainment and tooth cleaning material with periodontitis

Socio-demographic characteristics	p	O.R	95% C.I for O.R
Age (years)			
18 – 34	< 0.001	0.017	0.006 - 0.047
35 – 64	0.007	0.260	0.097 - 0.695
≥ 65		1.00	
Educational attainment			
Non-formal	0.010	4.121	1.402 - 12.111
Primary	0.375	1.450	0.638 - 3.294
Secondary	0.153	0.556	0.249 - 1.244
Tertiary		1.00	
Tooth cleaning material			
Chewing stick	0.029	8.500	1.247 - 57.931
Charcoal	0.702	1.380	0.265 - 7.194
Toothbrush and paste		1.00	

OR=Odds Ratio, C.I= Confidence interval

DISCUSSION

This study assessed the periodontal health of adults in a Nigerian rural community and observed that nearly all the study participants (99.6%) had periodontal disease [gingivitis (62.2%) and periodontitis (37.4%)]. The prevalence of periodontitis is within the reported range of prevalence of periodontitis (15% - 57%) in Nigeria.[1,9] But the prevalence of periodontal disease in this study is higher in comparison with a previous local study conducted in an urban setting.[1] The observed higher figure may be attributed to the difference in study setting as populations in rural areas do not have commensurate access to oral health services and awareness in comparison to urban populations.[7,16] In addition, reports indicate that oral health behaviour in Nigerian rural populations is suboptimal.[7] These noted factors will increase risk of periodontal disease occurrence in rural populations.[1,7,8,16] Gingivitis is a major contributor (62.4%) to periodontal disease in this study. This form of periodontal disease can be reversed on under appropriate clinical and oral self care. Oral promotional activities directed at increasing access to oral health services and optimal oral self care can therefore precipitate tangible improvement in the periodontal health by reducing the burden of periodontal disease of this group.

Periodontitis was observed to be higher in the older age groups. This finding enjoys support from prior studies.[1,9,10] Aregbede *et al.*,[17] reported that periodontitis is a cumulative disease due to prolong exposure to some risk factors like tobacco, alcohol, stress, uncontrolled diabetes and neglect of oral health. Age-associated changes to the oral tissues increase the vulnerability of older individuals to periodontitis.[4] Impairment of host immunity, increase the number of inflammatory cells and exaggerated response to the activities periodontopathic organisms are suggested mechanisms through aging affects the periodontal tissues.[2,4] However, gingivitis was more common in younger age group. This may be attributed to the suboptimal oral self-care practices noted in this study which is associated with poor oral hygiene.

Females reported better periodontal health than males in this study. This is not surprising as female had better oral hygiene practices than males in this study. This finding is analogous to a Nigerian rural study conducted by Azodo and Amenaghawon.[18] Nevertheless, opposing reports exists with males having better periodontal health than females.[19] Modulating influence of female hormones which favour the growth of periodontopathic microorganisms and increase the sensitivity of periodontal tissues to the harmful actions of these organisms have been proposed as reasons for better periodontal health in males.[17,19]

In this study, participants with lower educational attainment had lower prevalence of gingivitis and higher prevalence of periodontitis than study participants with higher educational attainment. Onigbinde *et al.*,[20] reported a similar finding and suggested that poor attention to oral health due to

low oral health awareness may be a causal factor to this finding. Higher educational attainment increases the chance to decent employment, income and better health.[21] This observation has led to the incorporation of quality education and decent work in the sustainable development goals strategies for a better world.[21] Better periodontal health in participants with higher educational attainment may be due to adequate income. Adequate income facilitates ease in making oral health promoting lifestyle choices such as uptake of good nutrition and preventive oral health services.[22]

Approximately a third of the study participants (31.4%) had tobacco and alcohol habits. This is higher than Nigeria's average of 5.6%.[23] Alcohol and tobacco have wide spread use as recreational and cultural items in Nigerian rural communities despite its harmful effects in all biological systems of the human body.[23,24] Oyapero *et al.,*[25] reported higher risks to periodontal disease among adults who use tobacco and take alcohol habitually. Evidence supports alcohol and tobacco act in a synergetic manner and dose-response relationship to increase the risk of periodontal disease.[25,26] Insights from clinical studies strongly suggest alcohol and tobacco increase the risk of periodontal disease through multiple mechanisms.[1,26] These mechanisms include reduced protective host response to the plaque organisms, amplified proliferation of destructive inflammatory cytokines and enzymes leading to increased periodontal tissue destruction.[26] Furthermore, periodontal tissue healing is impaired through weakened gingiva vascular response and reparative ability of periodontal cells.[1,17,26] The use of tobacco and alcohol in this group may be contributory to the high prevalence of periodontal disease observed in this group. There is a need for control of tobacco and alcohol in this group as the health benefits of this activity extends beyond periodontal health. This is because tobacco and alcohol are risk factors to other oral and systemic diseases.[17,26]

It was observed that participants who use chewing stick were at a higher risk of periodontitis than those using toothbrush and toothpaste in this study. A Central African study also reported that chewing stick users were more prone to periodontitis.[27] The non-exposure to the beneficial effects of toothpastes may be a major reason for this observation.[27] Aderinokun *et al.*,[28] however reported that chewing stick is effective as a tooth cleaning material if used appropriately.

In this study, the prevalence of periodontal disease was high even when nearly all the participants (94.1%) used toothbrush and paste as the tooth cleaning material. Although suboptimal oral self-care practices were reported in the study, improper tooth cleaning technique may be another attributory factor for this observation.

Study recommendations besides strengthening the oral health system in Nigerian rural communities include oral health education on proper use of chewing sticks, toothbrushes and pastes to reduce the prevalence periodontal disease. In addition, control of alcohol and tobacco use should be included in periodontal health promoting programs targeted at this group.

Conclusion

The prevalence of periodontal disease in this population was high but is in agreement with previous reports in Nigeria with respect to periodontitis. There is inequality in periodontal disease experience among the study participants with respect to age and educational attainment. Oral self-care practices were below optimal. There is a need for intervention through health promotion with special attention to older adults and persons with lower educational attainment to improve oral self-care practices and periodontal health in this group.

ACKNOWLEDGEMENT

The investigators wish to acknowledge the support from research assistants, Traditional Ruling Council of Udo Community and study participants.

Financial sponsorship

None declared.

Conflicts of interest

There are no conflicts of interest.

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