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Caries and Periodontal Health Status of Prison Inmates in Benin City, Nigeria

O. B. Braimoh^{1*}, O. O. Sofola² and S. A. Okeigbemen³

Department of Preventive Dentistry, Faculty of Dentistry, College of Health Sciences, University of Port Harcourt, Port Harcourt, Nigeria

Telephone: 08033562187, E-mail: doc_obm@yahoo.com

Department of Preventive Dentistry, Faculty of Dentistry, College of Medicine, University of Lagos, Lagos, Nigeria

Telephone: 08033031483, E-mail: oysofolo@yahoo.com

Department of Preventive Dentistry, Faculty of Dentistry, College of Medicine, University of Benin, Benin City, Nigeria

Telephone: 08056546215, E-mail: ajimen240@yahoo.com

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ABSTRACT: Objective: The objective of the study was to determine the dental caries status (DMFT), periodontal status and dental treatment needs of prisoners in Benin City, Nigeria. **Method:** The study was a cross-sectional survey involving prison inmates in Benin City. Inmates were selected by systematic random sampling and data were collected by structured interview and clinical examination. Dental caries and periodontal status were assessed according to World Health Organisation (WHO) criteria. **Results:** Prevalence of dental caries was 45% with a mean DMFT of 1.15. The mean DMFT increase significantly with age ($P = 0.038$). Analysis of the 840 sextant examined revealed that healthy periodontal tissues and gingival bleeding were the most prevalent with values of 46% and 28% respectively. No sextant was excluded. More females (18.2%) recorded healthy gingival tissues than males (3.9%). Deep pockets were significantly more likely in older inmates and those with lower frequency of tooth brushing. While oral hygiene instruction was required by 95% of the inmates, 87.9% needed scaling and polishing and most of the caries were not restored. **Conclusion:** This study found a high prevalence of dental caries, periodontal disease and high unmet dental needs among the prison population.

Key words: Dental Caries, Periodontal disease, Prisoners, Benin City.

Introduction

Periodontal disease and dental caries are the commonest oral health Problem encountered in Nigeria ⁽¹⁾. The prevalence of periodontal disease is quite high and the occurrence is related to age, oral hygiene status and socio-economic status ⁽²⁻⁹⁾.

*Author to whom all correspondence should be addressed.

Caries experience on the other hand varies between very low in rural areas to moderate in some urban communities. The prevalence varies between 4 – 30% with prevalence being higher in urban areas than rural areas⁽¹⁰⁻¹⁴⁾. While most oral health surveys conducted have consistently focused primarily on children, adolescents and adults from the general population; few have been conducted on disadvantaged groups. Worldwide there are disparities in the oral health of those from poor families compared with their counterparts of higher status and for disadvantaged groups with special health care needs^(15, 16).

Among the disadvantaged groups the health of prisoners is particularly of interest because of the increasing number of inmates^(17, 18). Prisoners are more vulnerable to a wide range of health problems including alcohol and drug abuse, infectious diseases, chronic diseases, psychosocial and psychiatric problems⁽¹⁹⁻²¹⁾. One area that is currently under-researched is the oral health status of individuals in the prison environment⁽²²⁾. Prisoners are a vulnerable and socially deprived group requiring attention as they are often neglected with little or no access to health care⁽²³⁾. Studies have shown that the common oral health problems affecting the normal population are to be seen in prisoners. In the later however, these problems are often more and with increased severity and poor oral hygiene may be an additional burden⁽²²⁻²⁶⁾. The objective of this study therefore was to determine the dental caries status (DMFT), periodontal status and dental treatment needs of prisoners in Benin City, Nigeria.

Materials and Methods

The study was a cross-sectional descriptive epidemiological survey involving prison inmates in Benin City. Benin City is the capital of Edo State located in Southern Nigeria with an estimated population of 1,147, 188 (2006 census). There are two federal prisons located in the City, this comprises of a maximum and medium prison. Both prisons contain male and female inmates serving various jail terms including those sentenced for life, prisoners condemned to death and awaiting trial. The prisons are provided with infirmaries, but no provision for oral health care. Total of 140 inmates were selected from both prisons using the systematic random sampling. The first subject was randomly selected from the sampling frame (register of prisoners), subsequently every inmate at sampling interval of eight (8) was selected until the desired sample size was attained.

The protocol for the study was approved by the Ethics Committee of the University of Benin Teaching Hospital. Permission to conduct the study was granted by Prisons authority in Benin City and informed consent was obtained from the subjects. Only those who consented to participate were included in the study.

Data was collected using structured questionnaires and oral examination. The structured questionnaires were self-administered and interviewer administered for illiterate prisoners. Information obtained includes sex, age, duration of incarceration, frequency of cleaning, material used for cleaning and educational level. Oral examination was done by a single examiner. Dental caries and periodontal status were assessed outdoor using direct sunlight as the source of light with the aid of mouth mirror, explorer and Community periodontal index (CPI) probe according to World Health Organisation (WHO) criteria⁽²⁷⁾.

Data Analysis

The questionnaires were sorted out; responses scored, coded and entered into the computer for analysis. Data entered were analyzed using Statistical Package for Social Sciences (SPSS version 13; SPSS Inc. Chicago, IL). Analysis of variance (ANOVA), Student t-text and Chi-square were used to text association between variables where necessary. Significance was determined at 0.05 and all p values were interpreted in a two-tailed manner. Means and standard deviations were used to describe the patterns of dental caries status calculated for all groups.

Results

Table 1 shows the demographic characteristics of the study population. A total of 140 inmates were selected. They ranged in age from 18 to 64 years with a mean age of 32.3 years (SD = 9.5). The age of the inmates was classified into five groups with equal class intervals. There were more subjects in the 26-33 year old age group. One hundred and twenty nine (92.1%) were males and eleven (7.9%) females. The ages of male inmates varied from 18 to 62 year while that of female inmates varied from 22 to 64 years. The difference in gender distribution was not

statistically significant. More than half of the prisoners (58.6%) had secondary education and 64.3% are smokers. The duration of incarceration ranged from 1-300 months with a mean of 45.2 (SD = 60.3) months. Majority (67.7%) had spent between 1-36 months in prison.

Prevalence of dental caries in this study was 45%. The analysis of the distribution of the various components of DMFT showed that decayed teeth was the most prevalent characteristics with the proportion of decayed, missing and filled teeth being 64.6%, 34.2 and 1.2% respectively. Forty-nine (35%) of the subjects had at least one decayed tooth. Some of the inmates had received dental treatment before incarceration; 2 (1.4%) had at least one filled tooth and 32 (38.6%) had at least one tooth missing due to dental caries. These results are shown in **Table 2**. The overall mean DMFT was 1.15 (SD = 1.84). There was a significant increase of mean DMFT with age ($P = 0.038$). The mean DMFT was higher in females (1.82) than males (1.09). This difference was however not significant ($P = 0.21$). These observations are shown in **Table 3**.

Healthy gingival tissues were found in 5% of the respondents and were classified in a CPI value of 0 with no treatment need while 95% recorded CPI score of one or more. More than half of the respondents 57.1% have calculus deposits (CPI score 2) in their mouths and therefore needs scaling and polishing in addition to oral hygiene instruction. However analysis of the 840 sextant examined revealed that healthy periodontal tissues and gingival bleeding were the most prevalent with values of 46% and 28% respectively. No sextant was excluded (**Table 4**). Multivariate analysis of Community periodontal index score and smoking indicate that healthy gingival was commoner in non smokers (71.4%) than in smokers (28.6%). Similarly, gingival bleeding on probing was less in smokers (30%) than in non smokers (70%). However, calculus deposits and periodontal pocket formation was greater in smokers than in non smokers. The results of these observations are presented in **Table 5**. More females (18.2%) recorded healthy gingival tissues than males (3.9%). All pockets ≥ 6 mm and 94.3% of pockets between 4-5mm were seen in the male inmates. Deep pockets were significantly more likely in older inmates and those with lower frequency of tooth brushing and Seventy-five percent of the deep pockets ≥ 6 mm were seen in inmates over 42 years (Table 6).

Most of the caries were not restored, while 77 (74%) required restorative treatment, 27 (26%) were indicated for extraction. Oral hygiene instruction was required by 95% of the inmates while 87.9% needed scaling and polishing. This is shown in **Figure 1**.

Discussion

The oral health status of a population is usually determined by the presence or absence of dental caries and periodontal disease as well as the level of oral hygiene found in the population. This is because the two diseases are regarded as the major oral diseases affecting man. Also oral hygiene has been closely associated with aetiology of both diseases especially periodontal disease⁽²⁸⁾.

The results of this cross-sectional study from a sample of prison inmates in Benin City, Nigeria, provided a unique opportunity for analysing the oral health status in this group. The prevalence of dental caries in this study was 45%. This prevalence result is higher compared to a study in Lagos, Nigeria by Awe-Adubiobi⁽²⁹⁾ who reported a prevalence of 33%. The difference in prevalence between these two studies is probably due to presence of oral health care services both curative and preventive in the Lagos prisons where the study was carried out. However when compared to other studies⁽²²⁻²⁵⁾ which reported a prevalence of 98 – 99%, this result is relatively low. This may be due to differences in dietary habits and other life style factors between developed and developing countries.

In this study the mean DMFT was 1.15 with a mean DMFT of between 0.73 – 2.20 across the different age groups. This mean is remarkably low when compared with other studies^(22-26, 30) especially in the developed countries which reported mean DMFT of between 9.8 – 22.4. In a study of federal male prisoners Mixson *et al.*, reported mean DMFT of 12.9 for inmates aged 20 – 34, 16.4 for inmates aged 35 – 44 and 22.1 for inmates aged 45 and older⁽²⁴⁾.

In another study where data was collected amongst a sample of 178 inmates in a state prison reported mean DMFT of 10.5 for those aged 18 - 29, 17.1 for aged 30 – 44 and 22.4 for inmates over age 44⁽²⁵⁾. Two other recent cross-sectional surveys demonstrated that the mean DMFT for a population of both sexes in correctional centres in Australia⁽²³⁾ was 20.4 and DMFT value of 10.4 and 15.4 were observed respectively in 92 male young offenders and in 96 male adult in the United Kingdom⁽³¹⁾. Nobile *et al.*, in a study to assess oral health status of male prisoners in Italy⁽²²⁾ reported a mean DMFT of 9.8 and in a South African study⁽²⁶⁾ Naidoo *et al.*, documented a mean DMFT of

15.5. The high DMFT recorded among prisoners in the developed countries have been attributed to unlimited access to refined sugar food products from vending machines ⁽²⁴⁾ and lower socioeconomic status of prisoners ^(32, 33).

Table 1: Demographic Characteristics of Study Population

Parameters	No	%
Age in years		
18-25	37	26.4
26-33	47	33.6
34-41	34	24.3
42-49	12	8.6
50 above	10	7.1
Sex		
Male	129	92.1
Female	11	7.9
Smoking		
Yes	90	64.3
No	50	35.7
Level of education		
No formal education	11	7.9
Primary education	40	28.5
Secondary education	82	58.6
Tertiary education	7	5.0
Duration of incarceration in months		
1-36	95	67.9
37-72	20	14.3
73-108	9	6.4
109-144	4	2.8
145-180	5	3.6
181 above	7	5.0

Table 2: Prevalence of Dental Caries among Prisoners in Benin City

Dental health indicators	No.	%
No of inmates caries free	77	55
No of inmates with caries	63	45
At least one decayed tooth	49	35
At least one missing tooth	32	22.9
At least one filled tooth	2	1.4
No of decayed teeth	104	64.6
No of missing teeth	55	34.2
No of filled teeth	2	1.2

Table 3: Mean DMFT in Relation to Age and Sex of Respondents

Parameters	No.	Mean $\pm$ SD
Age in years		
18 – 25	37	0.73 $\pm$ 1.37
26 – 33	47	1.17 $\pm$ 2.01
34 – 41	34	1.59 $\pm$ 1.91
42 – 49	12	1.65 $\pm$ 1.14
50 and above	10	2.20 $\pm$ 2.56
F = 2, P = 0.038		
Gender		
Female	11	1.82 $\pm$ 2.18
Male	129	1.09 $\pm$ 1.81
t = 1.26, P = 0.21		
Total	140	1.15 $\pm$ 1.84

Table 4: Frequency Distribution of Community Periodontal Index Score

Periodontal Status	Frequency	%
CPI Scores		
Healthy gingival (0)	7	5
Bleeding on probing (1)	10	7.1
Presence of calculus (2)	80	57.1
Periodontal pockets of 4-5mm (3)	35	25.0
Periodontal pockets $\geq$ 6mm (4)	8	5.7
Scores Per Sextants		
Healthy gingival (0)	386	46
Bleeding on probing (1)	235	28
Presence of calculus (2)	160	19
Periodontal pockets of 4-5mm (3)	42	5
Periodontal pockets $\geq$ 6mm (4)	17	2

Table 5: Cross Tabulation between Community Periodontal Index Score and Smoking

CPI Scores	Smoking		Non-smoking	
	No.	%*	No.	%*
Healthy gingival (0)	2	28.6	5	71.4
Bleeding on probing (1)	3	30.0	7	70.0
Presence of calculus (2)	52	65.0	28	35.0
Periodontal pockets of 4-5 mm (3)	27	77.1	8	22.9
Periodontal pockets of ≥ 6 mm (4)	6	75.0	2	25.0

*Percentage within Community Periodontal Index

Table 6: CPI Scores in Relation to Gender, Age and Frequency of Cleaning

CPI Score	0		1		2		3		4	
	No.	%	No.	%	No.	%	No.	%	No.	%
Gender*										
Female	2	18.2	0	0.0	7	63.6	2	18.2	0	0.0
Male	5	3.9	10	7.7	73	56.6	33	25.6	8	6.2
Cleaning Frequency**										
Once	4	3.8	4	3.8	60	57.8	29	27.9	7	6.7
Twice	3	8.3	6	16.7	20	55.6	6	16.7	1	2.7
P = 0.04										
Age***										
18 – 25	4	57.1	2	20.0	24	30.0	7	20.0	0	0.0
26 – 33	1	14.3	2	20.0	34	42.5	9	25.7	1	12.5
34 – 41	1	14.3	2	20.0	18	22.5	12	34.3	1	12.5
42 – 49	0	0.0	4	40.0	2	2.5	4	11.4	2	25.0
50 and above	1	14.3	0	0.0	2	2.5	3	8.6	4	50.0
P = 0.0000										

* Percentage calculated within gender

** Percentage calculated within Frequency of Cleaning

*** Percentage calculated within Community Periodontal Index

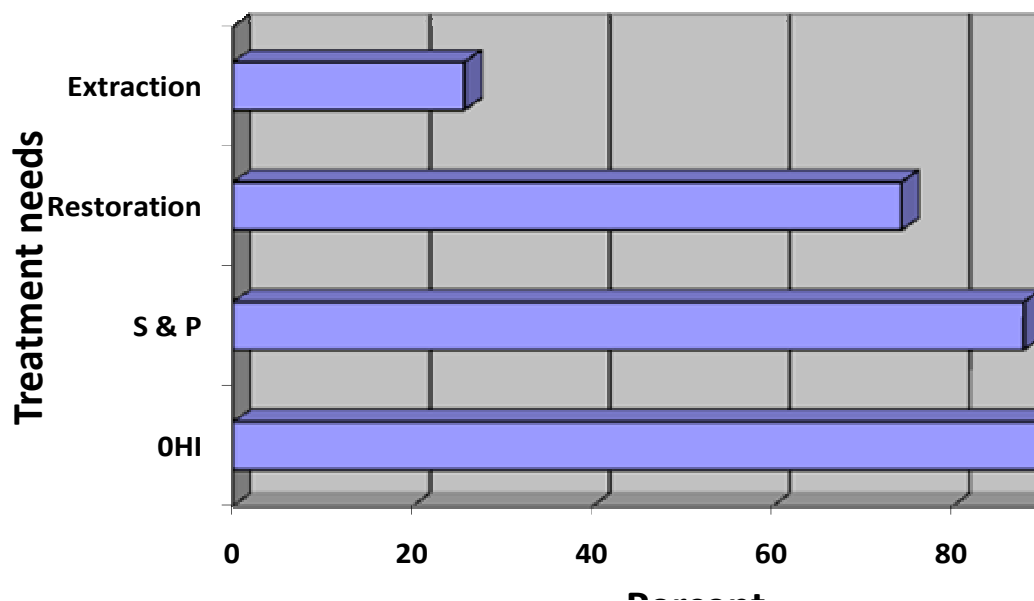


Figure 1: Dental treatment needs of inmates

Decayed teeth (D) were the most prevalent of the DMFT indicating deteriorated oral health and lack of treatment. This could be due to lack of access to oral health care services in the prison. This finding is consistent with the study of Heidari *et al.*, who reported decayed component as the most prevalent⁽³⁴⁾. Other studies^(22, 24, 25) have reported missing teeth as the most prevalent. It was observed in this study that there was a significant increase of mean DMFT with age and this seems to support the fact that dental caries is an age dependent disease. This finding is similar to other studies which reported increased mean DMFT with age^(22, 24, 25, 34). Though females had higher mean DMFT than males, this difference was not significant. This result is different from the findings of Boyer *et al.*,⁽³⁰⁾ who reported higher mean DMFT in males than in females.

Regarding periodontal health, only 5% of the subjects were found to have completely healthy periodontal tissues and were classified in a CPI value of 0 with no treatment need. Majority of subjects (95%) recorded CPI score of one or more with the highest numbers of individuals (57.1%) being classified as CPI of 2. Compared to another study in Italy⁽²²⁾, 10.5% of inmates had healthy periodontal tissues, 89.5% had a CPI score of one or more and majority of inmates (39%) had a CPI score of 2. The results obtained in this study were slightly higher and this may be due to lack of oral health services in the prison where this study was carried out, such that prisoners are not exposed to oral health education and information on oral health. However, Nigerians have been reported to have a high prevalence of periodontal disease by various studies from 1960s till date⁽²⁻⁹⁾. Deep pockets were more likely in older subjects and subjects with lower frequency of tooth brushing habit. This is in agreement with the work of Nobile *et al.*,⁽²²⁾ who reported similar findings. Considering that the data shows that 95% of the sample required at least oral hygiene instruction with extremely high needs for prophylaxis and 5% of the subjects required complex periodontal treatment, this study shows a high prevalence of periodontal treatment need in the population. This finding is consistent to that conducted in the United States and Italy where the need for prophylactic calculus removal was 93% and 89.5% respectively^(22, 35).

The relationship between smoking and oral health status is well established. This study revealed that smokers have less gingival bleeding on probing compared to non-smokers; this is similar to the results of other studies that have reported same^(36, 37). This may be attributable to vasoconstriction of gingival vessels as suggested by Palmer⁽³⁷⁾ and increased number of keratinised cells with heavier keratinisation of the gingivae of smokers⁽³⁸⁾. This study also reported that smokers accumulate more calculus deposits and have greater pocket depth than non-smokers. This result is in agreement with the report of other studies⁽³⁹⁻⁴³⁾. This may be due to significant poor oral hygiene exhibited by smokers^(40, 41) and less time spent by smokers in cleaning their teeth^(44, 45). The findings of this study is consistent with others on prison inmates which reported that inmates who smoked had worse dental outcome^(26, 46).

Conclusion

This study found a high prevalence of dental caries, periodontal disease and high unmet dental needs among the prison population and emphasises the need for planning and provision of systematic and comprehensive programmes to improve the oral health status of prisoners.

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