

## The effect of dental facilities on the processes of tooth loss between urban and rural populations in Edo State, Nigeria.

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### ABSTRACT

**Objectives:** The objective of this study was to ascertain the effect of the presence of dental facilities on the various processes of tooth loss in the study population and if there were differences between urban and rural subjects.

**Methods:** A total of 2,161 subjects were examined, comprising 769 from one urban area and 1392 from three rural areas of the State. Examinations were conducted with the use of a wooden spatula and the Community Periodontal Index of Treatment Need probe.

**Results:** The predominant process of permanent tooth loss in the entire study population was by extraction, followed by trauma and exfoliation. However, there was a statistical significant difference between the urban and rural subjects of the state. While the predominant process of tooth loss in urban subjects was by extraction but it varied from extraction through trauma to exfoliation amongst rural subjects.

**Discussion:** The predominant tooth loss in the urban subjects could be attributed to the presence and access to dental facilities located in the urban area of this study. Here extraction was the most common procedure carried out due to its low cost, relative to restoration or endodontics. This was the result of the poor state of the economy and the high prevalence of caries. The process of tooth loss by exfoliation, which was predominant in the rural subjects, is the result of periodontal ligament destruction and alveolar bone resorption. This could be attributed to a higher prevalence of periodontal disease and the non-existence of dental facilities and personnel where extraction could have been done without the long await for self-exfoliation.

**Conclusion:** This study has shown that the presence or absence of dental facilities and personnel are contributory factors to the different patterns of tooth loss in urban and rural populace.

**Keywords:** dental facilities, tooth loss, urban and rural population.

### INTRODUCTION

An investigation conducted in Nigeria by Odusanya<sup>1</sup>, has indicated that approximately 90% of permanent tooth loss by the process of extraction, are caused by periodontal disease and caries (46.4% and 43.9% respectively) followed by other important aetiologic factors which were trauma (4.5%), tooth impaction (2.4%) and orthodontic problem (1.6%). The loss of these permanent teeth was highest in the 2nd and 3rd decades of life. Within this short interval, 46.7% of the entire tooth loss recorded in this study took place. Of

this percentage, dental caries accounted for 34%. During the 4th decade of life the incidences of dental caries and periodontal disease were approximately equal. After the 4th decade however, periodontal disease was the primary aetiologic factor for tooth loss amongst Nigerians<sup>2</sup>. Similar findings and relationships have been reported in other countries<sup>3-8</sup>. However, the pattern of permanent tooth loss amongst Nigerian children showed that dental caries and its sequelae accounted for the highest indication for extraction (57.47%) while periodontal disease accounted for the least (0.45%). Deciduous teeth were mostly extracted with the deciduous molars being the teeth frequently extracted<sup>9</sup>

Social factors such as education, income, oral hygiene practices, tobacco consumption, have been reported to affect tooth loss<sup>7 10 11</sup>. Some studies have indicated that tooth loss occurs more in rural areas as compared to urban areas<sup>12 13</sup> which have lower dentist –patient ratio while others found no significant difference<sup>14</sup>. Prevalence of caries, which have been found to play a

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role in tooth loss, varies between developed and developing countries. In a study of dental caries occurrence between Nigeria, a developing country and Japan, a developed country, it found that the incidence of caries in Nigerian school children was much lower than that of their Japanese counterparts<sup>14</sup> and that the biting force of the Nigerian rural group (males and females) was significantly greater than those of the Nigeria urban group (males and females) and the Japanese males and females.<sup>15</sup> This has been attributed to be responsible for the higher rate of attrition in Nigerians which is known to affect the incidence of caries.<sup>16</sup>

Various reports of investigations conducted in sub-saharan Africa have shown that there are significant differences in the distribution of caries between the urban and the rural population. Caries is reported to be more prevalent in the urban than the rural population, mostly at younger ages.<sup>17-25</sup> while in adults differences in caries prevalence are not significant<sup>26,27</sup>

Some studies also in sub-saharan Africa have shown that there are significant differences in the prevalence of periodontal disease between the urban and rural areas and it is more prevalent in rural areas.<sup>17,28-30</sup> This difference has been attributed to low income and education and lack of dental awareness<sup>31</sup>.

All these have been reported to contribute to high tooth loss in the rural population due to periodontal disease as compared to caries being predominantly responsible for tooth loss in urban area.

It is important to note that most of these studies only indicated tooth loss by the process of extraction and did not take into account other processes of tooth loss such as exfoliation and trauma. It also did not indicate the localities of the patients involved i.e. if they were from urban or rural areas, because these factors have been shown to influence the prevalence of caries and periodontal diseases.<sup>711</sup>

This study, was to ascertain the various processes of tooth loss and to determine if there are differences between urban and rural areas. The influence of dental facilities/personnel on the pattern of tooth loss was to be investigated.

## METHODS

Edo State is located in mid-southern Nigeria, with a population of approximately 2.2 million. Benin City, which is the urban centre chosen for this study is the capital of the state and has a population of approximately 0.8 million<sup>32</sup>. The three (3) rural centres

used in this study are located within 20 kilometres of Benin City.

A total of 2,161 subjects were examined, comprising of 769 subjects from one urban area and 1392 subjects from three rural areas. All patients who reported at the various rural health centres (note: have no dental personnel or facilities) consisting of Nigerian Institute for Oil Palm Research (NIFOR) Health Centre, Primary Health Care Centres at Utekon and Ugbogiobo, during the study period were examined. At the University of Benin Teaching Hospital (Urban Centre), all the patients attending the Dental Centre for the first time during this period were also examined. At each centre where patients were seen, a questionnaire designed to obtain socio-demographic information was first administered to each subject, which was filled by each subject and where the subjects were not sufficiently literate or had difficulty with the questionnaire, assistance was provided by the authors. After the completion of the questionnaire, subjects were then examined. The examination of the mouth was carried out with the patient sitting on an armchair facing an open window with natural daylight used as the light source.

Examinations were conducted with the use of a wooden spatula and the Community Periodontal Index of Treatment Need (CPITN) Probe (WHO TRS 621). The CPITN examinations were carried out using the methods as outlined in the WHO guide on oral health surveys.<sup>33</sup>

## Data Management and Analysis

All the data were collected, edited and summarized by the authors. Data from subjects whose process of tooth loss were mixed e.g. extraction and exfoliation were not considered. Initial tabulation and analysis were carried out manually. Further statistical analysis were then carried out using the Epi Info 2000 version 1.1.2

Chi-square analysis was used as the test statistics for detecting associations between the dependent variable (urban vs. rural) and all the other variables. Also, to ensure effective comparisons between the urban and rural populations, simple percentages of the total subjects in each group were first obtained (as a measure of proportions) and then these were reduced to integers, before further analysis was undertaken. The alpha level was set

at 0.05. Missing responses were not included in any of the analyses.

## RESULTS

This study had shown that about one third (1/3) i.e. 32.2% of the entire population of subjects in this survey had lost one or more teeth, with more of the losses occurring among the urban population (57.2%) as compared to the rural population (17.9%). Table 1.

The predominant process of permanent tooth loss from the responses of the subjects of study in the entire population was by extraction (56.5%), followed by trauma (22.8%), then exfoliation (19.9%). However, there was a statistical significant difference in the process by which teeth were lost between the urban and rural areas of the state. While predominate process of tooth loss in the urban area was by extraction (67.5%), it varied from extraction through trauma to exfoliation (38.5%, 27.8%, 33.7% respectively) in the rural areas. Table 2. About half the entire population of those who lost their teeth, had lost only one tooth followed by those who lost only two (2) teeth. Only about a quarter of the entire population had lost three (3) teeth and above. This was also reflected in both urban and rural populations. Statistical analysis showed that there was no significant difference in the number of teeth lost per subject between urban and rural areas. Table 3.

Results of this survey had also shown that there was no significant difference in the prevalence of periodontal disease between those who had had any number of teeth loss and those who had complete compliment of teeth in the study population

It is important to note that a predominant proportion of the entire population had a CPITN score of 2 (TABLE 4). However, a significant difference existed in the prevalence of periodontal disease between urban and rural subjects who have had tooth loss. A total of 92.9% of rural subjects, who have lost their teeth, had CPITN score of code 2&3 as compared to 73.9% of urban subjects. None of those from rural area had a healthy periodontal condition or deep periodontal pockets as compared to urban subjects. (TABLE 5) A significant difference exists when the number of teeth lost per proportion of subjects was compared between urban and rural areas. (Table 6)

## DISCUSSION

Previous studies conducted in Nigeria by Odusanya<sup>1</sup>

and Denloye<sup>9</sup> has reported that the process of tooth loss is by extraction. However, this study has shown that teeth are lost not only by extraction which was predominant in urban subjects, but are also lost in Nigeria by other means such as exfoliation and trauma which were predominant in rural subjects as compared to urban. It had shown that one third of the entire subjects with permanent teeth had been involved in tooth loss and affecting more of the urban subjects than their rural counterparts in an approximate ratio of 3:1.

It is important to note that tooth loss due to exfoliation in this study, is as a result of bone resorption which is probably the most critical factor in the attachment loss of periodontitis leading to eventual tooth loss

The predominant tooth loss in urban area could be attributed to the high incidence of caries, which has been reported to be predominant in urban areas as compared to rural areas<sup>17-25</sup>. And it has been reported to be one of the major causes of tooth loss, mostly at younger ages.<sup>1,29</sup>

This study has shown that the tooth loss in the urban subjects is predominantly by process of extraction while that of the rural subjects is predominantly by exfoliation and trauma. This high rate of extraction in the urban subjects could be attributed to the easy access to dental facilities, mostly in government owned and funded centers, including the numerous private dental clinics. All are located in the urban area of this study. Here the cost of extraction relative to restoration or endodontics is far cheaper. In addition, the poor state of the economy has affected the ability of majority of the subjects to afford restorative treatment. Similar studies conducted to assess tooth loss among Nigerians<sup>1, 34, 35</sup>, were all carried out on urban subjects, which reported caries to be a major reason for tooth loss. Rural dwellers are expected to have a lower caries prevalence coupled with non-availability of dental services. This could have accounted for a lower proportion of them losing their teeth through extractions.

The statistical significant difference that existed in this study in the tooth loss between urban and rural subjects which was in favour of urban subjects, could be attributed to the high incidence and prevalence of caries, where signs and symptoms manifest early in life but is usually reported late, when restoration or endodontics may no longer be indicated. Also, due to the poor state of the economy, most patients could not afford the cost of restoration. The prevalence of

**Table 1: Permanent tooth loss between urban and rural subjects**

LOCATION OF SUBJECTS			
Subjects who Have lost permanent teeth	Urban (%)	Rural(%)	Total (%)
No	329(42.8)	1143(82.1)	1472(67.8)
Yes	440(57.2)	249(17.9)	689(32.2)
Total	769(100)	1392(100)	2161(100)

$X^2 = 22.58$ ; d.f. = 3;  $p < 0.05$

**Table 2: Subjects explanation for tooth loss**

LOCATION OF SUBJECTS			
Method Of Tooth Loss	Urban (%)	Rural (%)	Total (%)
Exfoliation	63(11.4)	113(33.7)	176(19.9)
Trauma	109(19.8)	93(27.8)	202(22.8)
Extraction	371(67.5)	129(38.5)	500(56.5)
Others (orth. Prosth. etc)	7(1.3)	0(0.0)	7(0.8)
Total Responses	550(100.0)	335(100.0)	885(100.0)

$X^2 = 22.58$ ; d.f. = 3;  $p < 0.05$

**Table 3: Number of permanent tooth loss per subject between urban and rural subjects**

LOCATION OF SUBJECTS			
Number of Subjects who Have lost	Urban (%)	Rural (%)	Total (%)
One tooth	231(52.5)	105(42.2)	336(48.7)
Two teeth	105(23.9)	63(25.3)	168(24.4)
Three "	34(7.7)	21(8.4)	55(8.0)
Four or more	66(15.0)	51(20.5)	117(17.0)
All	4(0.9)	9(3.6)	13(1.9)
<b>Total</b>	<b>440 (100.0)</b>	<b>249 (100.0)</b>	<b>689 (100.0)</b>

$X^2 = 3.57$  d.f. = 4:  $p > 0.05$  not significant

**Table 4: Prevalence of periodontal disease between subjects who have not Lost any permanent teeth and those who have lost**

LOCATION OF SUBJECTS			
CPITN (max) Scores	Not Lost (%)	Lost (%)	Total (%)
0	44(3)	28(4.1)	72(3.3)
1	110(7.5)	91(13.5)	201(9.3)
2	1124(76.4)	424(62.7)	1548(72.0)
3	179(12.1)	121(17.9)	300(14.1)
4	15(1)	12(1.8)	27(1.3)
<b>TOTAL</b>	<b>1472(100.0)</b>	<b>676(100.0)</b>	<b>2148(100.0)</b>

$\chi^2 = 4.08$ , d.f. =4;  $p > 0.05$ (not significant)

**Table 5: Prevalence of periodontal disease amongst Subjects who have lost permanent teeth between urban and rural areas**

LOCATION OF SUBJECTS			
CPITN (max) Scores	Urban (%)	Rural (%)	Total (%)
0	28(6.4)	00(0.0)	28(4.1)
1	74(17)	17(7.1)	91(13.5)
2	272(62.4)	152(63.3)	424(62.7)
3	50(11.5)	71(29.6)	121(17.9)
4	12(2.7)	00(0.0)	12(1.8)
<b>TOTAL</b>	<b>436(100.0)</b>	<b>240(100.0)</b>	<b>676(100.0)</b>

$\chi^2 = 20.89$  d. f. = 4;  $p < 0.5$ (Significant)

**Table 6.: Relationship between subjects history of permanent tooth loss and prevalence of periodontal disease**

Reported Number of Teeth		CPITN (MAX) PERCENTAGE SCORE STAT.						
Lost	Area	No	0	1	2	3	4	Signif.
One Tooth	U	231	4.8	16.4	76.6	0.9	1.3	$P < 0.001$
	R	105	-	9.5	50.5	40.0	-	Sig
Two Teeth	U	105	14.3	21.9	48.6	11.4	3.8	$P < 0.001$
	R	63	-	7.9	74.6	17.5	-	Sig
Three Teeth	U	34	-	14.7	52.9	32.4	-	$P < 0.05$
	R	21	-	4.8	47.6	47.6	-	Sig
Four And Above	U	66	2.7	12.0	40.0	37.3	8.0	$P < 0.001$
	R	51	-	1.7	81.7	16.7	-	S Ig.
Lost All Teeth	U	4	-	-	-	-	-	
	R	9	-	-	-	-	-	

periodontal disease is also high but not as high as that of rural subjects, which also has contributed to tooth loss in the urban area. These combined factors of presence of dental facilities, periodontitis and the high prevalence of caries can be inferred to be responsible for the high rate of tooth loss by process of extraction

Tooth loss by process of exfoliation in this study, (which is predominant among the rural subjects) is as a result of periodontal ligament destruction and alveolar bone resorption, which are signs and symptoms of periodontal disease. This has been attributed to poor oral hygiene and access to information, mostly about standard oral hygiene. In addition, low level of education, income, and the non-existence of dental facilities and personnel where preventive measures or extractions could have been done. These patients must have endured some discomfort for a long time before tooth exfoliation.

The absence of dental clinics in the rural areas in this survey could be associated with the low process of tooth loss mostly by the process of extraction while the higher prevalence of periodontal disease amongst the rural subjects could be related with the high rate of tooth loss by exfoliation

Periodontal diseases have been reported to be more prevalent among rural subjects as compared to urban<sup>21, 35</sup> The report of a study conducted in Lagos State Nigeria, has corroborated the role of location, income, education and oral hygiene habits on the oral hygiene status of the study subjects.<sup>28</sup>

Tooth loss by traumatic process, which was predominant amongst the rural compared urban subjects, could be associated with lack of dental facilities where conditions of this sort could have been managed. As earlier stated in this study, dental facilities were not available in rural areas.

This study has indicated that there was no statistical significant difference in the proportions of the subjects that have lost various numbers of teeth between urban and rural subjects. However, there was a statistical significant difference in the prevalence of periodontal disease amongst those who have lost their teeth between urban and rural subjects, which is an indication of the role periodontal disease conditions may have played in tooth loss mostly as regards, the high history of exfoliation in rural areas. This is because previous studies had indicated periodontal disease as a major cause of tooth loss<sup>12</sup>

## CONCLUSION

This study has indicated that the presence of dental facilities and personnel that are not orientated and equipped towards the prevention of preventable dental diseases and the location of the subjects could be a factors associated with tooth loss.

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