

Simultaneous occurrence of periodontal disease and dental caries in Ibadan secondary school children

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Abstract

Objective: To assess the simultaneous occurrence of periodontal disease and dental caries in Ibadan secondary school children.

Method: This study was a cross-sectional study in 12 to 15 year old private and public secondary school children in Ibadan. Twenty one (nine private and twelve public) secondary schools in Ibadan were chosen using the proportional sampling method and children who gave assent and their parents gave consent were recruited into the study and ethical approval was obtained. Oral examinations were done under natural light outdoors using WHO standard criteria for caries. The criteria as proposed by the executive summary in the guidelines for periodontal screening and management of children and adolescents under 18 years of age was used to assess the level of periodontal disease. Periodontal screening for this group of children and adolescents assesses six index teeth (UR6, UR1, UL6, LL6, LL1 and LRR) using the simplified BPE (Basic Periodontal Examination) to avoid the problem of false pockets. Teeth with probing pocket depth (PPD) of 4mm and deeper indicated periodontitis while teeth with gingival bleeding on gentle probing without pocketing indicated gingivitis and both were considered to be periodontal diseases.

Result: One thousand five hundred and seventy one subjects were recruited into the study out of which only 174 (11.1%) had dental caries, 1422 (90.5%) had periodontal disease out of which 1419 (90.3%) had gingivitis and only three (0.2%) subjects had shallow pockets on probing. Only 159 (10.1%) had both disease conditions simultaneously; the three (0.2%) subjects that had shallow pockets did not have dental caries, 15 (1%) of the subjects that had dental caries and 135 (8.6%) that were caries free had healthy periodontium.

Conclusion: Simultaneous occurrence of periodontal disease and dental caries in this group of secondary school children studied was not significant. Periodontal disease and dental caries have many common related etiological factors and the objective of this study is to assess simultaneous occurrence of these two dental diseases in Ibadan secondary school children.

Key words: Gingivitis, periodontal disease, caries, school children, Nigeria

Introduction

Dental caries and periodontal disease have been reported as the most important causes of global oral disease burden⁽¹⁾. According to WHO Global Oral Health Data Bank, dental caries affects 60-90% of school-aged children and a vast majority of adults while periodontal disease are highly prevalent among adults in all regions⁽¹⁾. It has also been reported that most children and adolescents worldwide are found to have signs of gingivitis, which is the earliest and mildest form of periodontal diseases⁽¹⁾. Aggressive periodontitis, a severe periodontal condition affecting individuals during puberty has been reported as one of the causes of premature tooth loss in young people⁽²⁾. In Nigeria, a number of epidemiological studies conducted on the causes of tooth morbidity and mortality among

Nigerians generally have shown that the commonest cause of tooth loss is dental caries in children and chronic periodontal disease in adults^(3,4,5,6,7). Following the British Society of Periodontology (BSP) policy statement⁽⁸⁾ relating to the screening and management of periodontal problems, it was recognized that there is a need for the formulation of a document pertaining to the screening and management of periodontal diseases in children and adolescent population⁽⁹⁾. These guidelines⁽¹⁰⁾ were formulated to set out the recommendations of the British Society of Periodontology (BSP) and British Society of Paediatric Dentistry (BSPD) for the periodontal screening and management of children under 18 years of age. The aims of these guidelines were: (1) To outline a method of screening children and adolescents for periodontal diseases and (2) To provide guidance on when it is



appropriate to treat in a practice or to refer specialist services⁽¹⁰⁾. Periodontal screening for children and adolescents assesses six index teeth (UR6, UR1, UL6, LL6, LL1 and LR6) using a simplified Basic Periodontal Examination (BPE) to avoid the problem of false pocket⁽¹¹⁾. The WHO 621 style probe with a 0.5mm ball end, black band at 3.5mm to 5.5mm and additional markings at 8.5mm and 11.5mm was proposed to be used⁽¹⁰⁾. This committee⁽¹⁰⁾ recommended full range codes of 0,1,2,3,4 and * for children and adolescents aged 12 to 15 years and the criteria for these codes are: 0—Healthy periodontium; 1—Bleeding after gentle probing; 2—Calculus or plaque retention factors; 3—Shallow pockets 4mm to 5mm, 4—Deep pocket 5mm or more and *—Furcation. Dental caries and periodontal disease share many microbiological, social and behavioural factors in common which have been related to their aetiology^(12,13). It has been known for many years that microorganisms, which colonize the tooth surfaces, constitute the primary etiologic component for dental caries and periodontitis⁽¹⁴⁾. Based on the aetiology of these major dental diseases, it was reported that these diseases may be prevented to a large extent by measures directed towards the control of bacterial plaque formation and by daily use of fluoride containing dentrifices⁽¹⁴⁾. Dental plaque and biofilm formation are related to both diseases⁽¹⁵⁾ and both diseases share many social and behavioral background factors in common which have been related to their aetiology⁽¹³⁾. However, the bacteriological spectrum of these two diseases differ and while the role of dental plaque in the etiology of dental caries is through demineralization processes, it is opposed to mineralization process seen in calculus formation in the etiology of periodontal diseases⁽⁶⁾. Although dental caries and periodontal diseases share common etiologic and predisposing factors, previous studies on their simultaneous occurrence in an individual have been mainly among adult population and the various findings have also been contradictory^(17,18,19,20). Positive association was reported by Albander et al⁽²⁰⁾ while Sewon et al⁽¹⁷⁾ reported a negative association and Klnane et al⁽¹⁹⁾ reported no association. The objective of this study therefore is to assess the simultaneous occurrence of these two major dental diseases in secondary school children in this environment. Findings from this study may produce important information for formulation of Oral health policies in this group of children.

Materials and method

This was a cross-sectional study in which children aged 12 to 15 years from both private and public secondary schools in Ibadan, Nigeria were examined for dental caries and periodontal diseases. Ibadan is a town in the South Western part of Nigeria with a population of about two million⁽²¹⁾. The participants for the study were selected from both private and public secondary schools in five local government areas in Ibadan metropolis. The list of all private and public secondary schools in the local government areas was obtained from Oyo state ministry of education and twenty one schools (9 private and 12 public secondary schools) were chosen using the proportionate

sampling method. Ethical clearance for this study was obtained from Oyo State Ministry of Health and permission to visit the schools selected was given by principals of the individual schools. Children within the age groups being considered were found in junior secondary school two, three (JSS 2 & 3) and senior secondary school one (SSS 1). The private and public schools have an average of 2 and 4 arms per class respectively, with approximately 20 and 30 students in each class respectively. At each school, children who gave assent and whose parents gave consent were recruited into the study. Demographic data for each participant was obtained and their socioeconomic status was determined using socioeconomic index score of Oyedeji⁽²²⁾.

Oral examinations were conducted by the field team which are dentists under natural light outdoors with sterile mouth mirror and WHO BPE probe. Examination for dental caries was done according to WHO standard and criteria⁽²³⁾ by the investigators. The calibration of the two examiners (EBD and BOP) was done by repeat examination of 20 children on three occasions. The results were subjected to Cohen's Kappa statistics and intra-class correlation coefficient for inter and intra-examiner reliability values were 0.8 and 0.9 respectively. Caries experience was expressed as the number of decayed, missing (due to caries) and filled teeth. Periodontal screening assessed six index teeth (UR6, UR1, UL6, LL6, LL1 and LR6) using a simplified Basic Periodontal Examination (BPE) to avoid the problem of false pocket⁽¹¹⁾. The WHO 621 style probe with a 0.5mm ball end, black band at 3.5mm to 5.5mm and additional markings at 8.5mm and 11.5mm was proposed to be used⁽¹⁰⁾. The index teeth in each sextant were examined by running the BPE probe around the whole sulcus of each tooth and the highest score recorded. Assessing with the BPE Code, the participants were categorized thus; BPE Code 0 = healthy periodontium, BPE codes 1 & 2 = gingivitis and BPE codes 3 & 4 = periodontitis.

Data obtained were analysed using SPSS Version 20.0. Descriptive statistics was used to summarise the variables in the data set. Chi-square test was employed to test association involving discrete data while the student's t-test and ANOVA were used to compare the means between two and three groups respectively. The level of significance was set at $P < 0.05$.

Result

A total of 1571 secondary school children aged 12 -15 years were examined for dental caries and periodontal disease. **Table 1** shows the socio-demographic characteristics of the participants. Nine hundred and eighteen (58.4%) were from public schools while 653(41.6) were from private schools. There were 654(41.6%) boys with mean age of 13.2 ± 1.0 years and 917(58.4) girls with mean age of 13.1 ± 1.0 years. Prevalence of dental caries according to the socio-demographic factors is shown in **Table 2**. Majority (89.0%) of these children were caries free while one hundred and

Table 1. Sociodemographic characteristics of the children

Variable	No (%) of Children N= 1571
Gender	
Male	654(41.6)
Female	917(58.4)
Age (years)	
12	485(30.9)
13	516(32.8)
14	378(24.1)
15	192(12.2)
Social class	
High	376(23.9)
Middle	676(43.0)
Low	519(33.0)
Type of school	
Public	918(58.4)
Private	653(41.6)

seventy three (11.0%) had dental caries with the mean DMFT of 0.18 ± 0.58 . Female children had significantly higher mean DMFT compared with males ($p < 0.05$) and private schools children also had significantly higher mean DMFT compared with public school children (**Table 2**). The prevalence of periodontal disease in these children was 90.5% and this was largely accounted for by gingivitis because only 3 (0.2%) of all the children had evidence of periodontitis. Only one hundred and fifty children (9.5%) had healthy periodontium (**Table 3**). From Table 3, gingivitis was significantly higher in 12 and 13 year old compared with 14 and 15 year old ($p < 0.05$). Also, participants from middle /low social class and public schools had significantly higher prevalence of gingivitis compared with children from high social class and private schools respectively ($p < 0.05$). There was no significant relationship in the simultaneous occurrence of dental caries and periodontal disease in the children studied both overall and on the basis of their socio-demographic variables ($p > 0.05$) as shown in **Table 4**.

Table 2. Dental caries prevalence according to Sociodemographic factors

Variable	n (%)	Caries Present	Caries Absent	Mean DMFT	t test /ANOVA P value
Gender					
Male	654(41.6)	68(10.4)	586(89.6)	0.15 ± 0.5	t-test = 7.11, p = 0.008
Female	917(58.4)	105(11.5)	812(88.5)	0.19 ± 0.6	
Age(yrs)					
12	485(30.9)	49(10.1)	586(89.6)	0.16 ± 0.6	F-test= 0.96, p= 0.412
13	516(32.8)	60(11.6)	456(88.4)	0.18 ± 0.6	
14	378(24.1)	47(12.4)	331(87.6)	0.21 ± 0.7	
15	192(12.2)	17(8.9)	175(91.1)	0.14 ± 0.5	
Social class					
High	376(23.9)	48(12.8)	328(87.2)	0.21 ± 0.6	F-test = 1.17 p = 0.311
Middle	676(43.0)	68(10.1)	608(89.9)	0.18 ± 0.6	
Low	519(33.0)	57(11.0)	462(89.0)	0.15 ± 0.5	
School Type					
Public	918(58.4)	93(10.1)	825(89.9)	0.15 ± 0.5	t-test= 10.37 p = 0.001
Private	653(41.6)	80(12.3)	573(87.7)	0.20 ± 0.6	
Overall	1571(100.0)	173(11.0)	1398(89.0)	0.18 ± 0.59	



Table 3. Prevalence of periodontal disease according to sociodemographic factors

Variables	n(%)	Healthy Periodontium n(%)	Gingivitis n(%)	Periodontitis n(%)	Chi-square, P value
Gender					
Male	654(41.6)	65(9.9)	588(89.9)	1(0.2)	X ² = 0.01, p=0.87
Female	917(58.4)	85(9.3)	830(90.5)	2(0.2)	
ages (year)					
12	485(30.9)	42(8.7)	441(90.9)	2(0.4)	X ² = 0.09, p=0.03
13	516(32.8)	39(7.6)	477(92.4)	0(0.0)	
14	378(24.1)	39(10.3)	338(89.4)	1(0.3)	
15	192(12.2)	30(15.6)	162(84.4)	0(0.0)	
Social class					
High	376(23.9)	65(17.3)	310(82.2)	1(0.3)	X ² = 0.15, p = 0.01
Middle	676(43.0)	48(7.1)	626(92.6)	2(0.3)	
Low	519(33.0)	37(7.1)	482(92.9)	0(0.0)	
School Type					
Public	918(58.4)	63(6.9)	855(93.1)	0(0.0)	X ² = 0.12, p= 0.01
Private	653(41.6)	87(13.3)	563(86.2)	3(0.5)	
Overall	1571(100.0)	150(9.5)	1414(90.3)		

Table 4. Simultaneous occurrence of dental caries and periodontal disease based on sociodemographic factors

Variables	Dental caries Status	Periodontal status			Total No N (%)	Chi square (X ²)	P value
		Healthy Periodontium n(%)	Gingivitis n(%)	Periodontitis n(%)			
Overall	Present	15 (1.0)	159 (10.1)	0(0.0)	174 (11.1)	0.553	0.76
	Absent	135 (8.6)	1260 (80.2)	3 (0.2)	1398		
Gender							
Male	Present	10(0.6)	58(3.7)	0(0.0)	68(4.3)	2.03	0.3
	Absent	55(3.5)	530(33.7)	1 (0.2)	586(37.3)		
Female	Present	5(0.3)	100(6.4)	0(0.0)	105(6.7)	3.15	0.2
	Absent	80(5.1)	730 (46.5)	2(0.2)	812(51.7)		
Age (years)							
12	Present	3(0.2)	46(2.9)	0(0.0)	49(3.1)	0.68	0.7
	Absent	39(2.5)	395(25.0)	2(0.1)	436(27.8)		
13	Present	7(0.4)	53(0.3)	0(0.0)	60(3.8)	1.64	0.2
	Absent	32(2.0)	424(27.0)	0(0.0)	456(29.0)		
14	Present	2(0.1)	45(2.7)	0(0.0)	47(3.0)	2.34	0.3
	Absent	37(2.3)	293(18.7)	1(0.1)	331(21.1)		
15	Present	3(0.2)	14(0.9)	0(0.0)	17(1.1)	0.06	0.8
	Absent	27(1.7)	148(9.4)	0(0.0)	175(11.1)		
Social class							
High	Present	5(0.3)	43(2.7)	0(0.0)	48(3.1)	1.99	0.3
	Absent	60(3.8)	267(17.0)	1(0.1)	328(20.9)		
Middle	Present	3(0.2)	65(4.1)	0(0.0)	68(4.3)	5.10	0.5
	Absent	45(2.9)	561(35.7)	2(0.1)	608(38.7)		
Low	Present	7(0.4)	50(3.2)	0(0.0)	57(3.6)	2.57	0.1
	Absent	30(1.9)	432(27.5)	0(0.0)	462(29.4)		
School type							
Public	Present	7(0.4)	86(5.5)	0(0.0)	93(5.9)	0.06	0.7
	Absent	56(3.6)	769(49.0)	0(0.0)	825(52.5)		
Private	Present	8(0.5)	72(4.6)	0(0.0)	80(5.1)	1.33	0.5
	Absent	79(5.0)	494(31.4)	3(0.2)	573(36.5)		



Discussion

Dental caries and periodontal disease have been found to be the most common oral diseases causing the greatest oral health burden worldwide⁽¹⁾. Caries experience of the children in this study was similar to findings from a previous study in this environment where prevalence of 11.2% with mean DMFT of 1.90 ± 1.0 was found in 12-14 year old school children⁽²⁴⁾. However, the prevalence in this study was lower than that reported in a previous study carried out in the North Central and South Southern parts of Nigeria⁽²⁴⁾. This difference in caries prevalence in different parts of the country has been attributed to the difference in quantity and rate of sugar consumption among the children in the various zones, as well as the level of awareness of prevention of dental caries in the studied populations⁽²⁵⁾. The prevalence of periodontal disease in the studied group is high and is accounted for mainly by gingivitis. This is similar to previous findings in this environment^(26,27,28) in which gingivitis have been found to be the most commonly found periodontal diseases in children population. This high prevalence of gingivitis in children was attributable to the combined effect of oral cleanliness, oral bacterial composition, inflammatory cell response and hormones of puberty in children population⁽²⁹⁾.

Despite the fact that dental caries and periodontal disease share microbiological, social and behavioural factors in common, the present study observed no simultaneous occurrence of dental caries and periodontal disease in these children which was similar to previous studies^(11,12,13). These studies reported no association in the simultaneous occurrence of periodontal disease and dental caries in an individual. These authors attributed their findings to the fact that bacteriological spectrum involved in the pathogenesis of dental caries differ from that of periodontal diseases. They also stated that the demineralization processes seen in the development of dental caries is opposite the mineralization processes seen in calculus formation which is an important aetiological factor of periodontal diseases⁽¹¹⁾. Similarly, other related studies^(12,13), reported no correlation between the prevalence of caries and periodontal disease despite the fact that both conditions have microbial plaque as a common aetiological factor. However, Albandar et al⁽¹⁴⁾, reported a positive association between these two dental diseases. They attributed their findings to the microbiological aetiology of both diseases, despite the fact that the typical bacterial species responsible for these diseases differ from each other. These author⁽¹⁴⁾ supported their findings with the fact that plaque biofilm formation is related to both diseases⁽²⁵⁾ and that both diseases share behavioural, bacteriological and host response-related factors in common, which have been related to their aetiology^(8,9).

In conclusion, the simultaneous occurrence of dental caries and periodontal disease in this study was not significant. However, the high prevalence of gingivitis observed show the need for dental professionals to intensify school visits and to employ practical demonstrations to achieve good

oral hygiene in children. There is also a need to involve school teachers in oral health education and probably include instructions on oral health care in the school curriculum as part of oral policy formulation.

References

1. WHO 2005: Bulletin of the World Health Organization 2005; 83:661-669. Global oral health data bank. Geneva: World Health Organization; 2004.
2. Albander JM, Brown LJ, L  eH. Clinical features of early-onset periodontitis. *J Am Dent Ass* 1997;128: 1393-1399.
3. Kekere-Ekun TA, Adenubi JO. The pattern of exodontia in children treated at Lagos University Teaching Hospital. *Nig Dent J* 1985; 6:10-19.
4. Abiose BO. Dental problem of the Nigerian child. *Nig Med J* 1986; 17:65-70.
5. Odusanya SA. Age and Sex distribution of tooth mortality among Nigerians. *West Afr J Med* 1989; 8:50-53.
6. Jeboda SO. Deciduous tooth loss in Nigerian Children. *Paediatr Dent J* 1991; 1:195-200.
7. Denloye OO, Dosumu OO, Arotiba JT. Causes and pattern of tooth extraction in children treated at the University College Hospital Ibadan. *West Afr J Med* 1999; 18:261-264.
8. British Society of Periodontology. Periodontology in General Dental Practice in the United Kingdom. A Policy statement 2001.
9. Clerehugh V. Periodontal diseases in children and Adolescents. *Br Dent J* 2008; 204:469-471.
10. Executive Summary Guidelines for Periodontal Screening and Management of Children and Adolescents Under 18years of Age. Prof. Clerehugh V. (BSP) and Dr Kindelan S (BSPD).
11. Alnamo J, Nordblad A and Kallio P. Use of CPITN in populations under 20years of age. *Int Dent J* 1984; 34: 285-291.
12. Tervonen T, Knuuttila M, Nieminen P. Risk factors associated with abundant dental caries and periodontal pocketing. *Community Dent Oral Epidemiol* 1991; 19:82-87.
13. Hobdell MH, Oliveira ER, Bautista R, Myburgh NG, Laloo R, Narendran S, Johnson NW. Oral diseases and socio-economic status (SES). *Br Dent J* 2003; 194:91-96.
14. Axelsson PJ, Lindhe J. Effect of controlled oral hygiene procedures on caries and periodontal disease in adults. *J Clin Periodont* 1994; 8:239-248.
15. Rosan B, Lamont RJ. Dental plaque formation. *Microbes Infec* 2000; 2:1599-1607.
16. Mattilda PT, Niskanen MC, Vehkalahti MM, Nordblad A, Knuuttila MLE. Prevalence and simultaneous occurrence of periodontitis and dental caries. *J Clin Periodontol* 2010; 37:962-967.
17. Sewon LA, Parvinen TH, Sinisalo TVH, Larmas MA, Alanen PJ. Dental status of adults with and without periodontitis. *J Periodontol* 1988; 59:595-598.
18. Frentzen N, Schuler N, Nolden R. Correlation between caries prevalence (DMFS) and periodontal condition (CPITN) in more than 2000 patients. *Int Dent J* 1990; 40: 313-318.



19. Kinane DF, Jenkins WM, Adonogianaki E, Murray GD. Cross-sectional assessment of caries and periodontitis risk within the same subject. *Community Dent Oral Epidemiol* 1991; 19:78-81.
20. Albandar JM, Buischi YA, Axelsson P. Caries lesions and dental restorations as predisposing factors in the progression of periodontal diseases in adolescents. A 3-year longitudinal study. *J Periodontol* 1995; 6: 249-254.
21. Federal Secretariat, National Population Commission, Statistics Section, Ibadan, Nigeria. 2001.
22. Oyedeji GA. Socioeconomic and Cultural Background of Hospitalized Children in Ilesha. *Nig Paediat J* 1985; 12:111-117.
23. World Health Organization. Oral Health Surveys. Basic Methods. 4th ed. Geneva, 1997.
24. Denloye OO, Ajayi D, Bankole O. A study of dental caries prevalence in 12-14 year old school children in Ibadan, Nigeria. *Paediatr Dent J* 2005; 15:147-151.
25. Akpata ES. Flouride, dental fluorosis and caries experience in Nigeria. Project report. RCORTI. June 2003.
26. Adenubi, JO. The Gingival Health of Eight-Year-Old Nigerian Children. *J Public Health Dent* 1984; 44:67-72.
27. Odal CD, Azodo CC, Braimoh OM, Obuekwe ON. Oral health profile of primary and post-primary school children at a health facility in Uselu, Benin city. *Benin J Postgrad Med*, 2009; 11: 34-39.
28. Kolawole KA, Oziegbe EO, Bamise CT. Oral hygiene measures and the periodontal status of school children. *Int J Dent Hygiene* 2011; 9:143-148.
29. Borrell LN, Papapanou PN. Analytical epidemiology of periodontitis. *J Clin Periodontol* 2005; 32:132-158.