Prevalence and Risk Factors for Periodontal Diseases Seen in Children Attending the University of Benin Teaching Hospital for Dental Treatment

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Abstract

Background: Periodontal diseases are common in children, adolescents and adults. It affects the tissues that make up the periodontium. **Aim:** The aim of this study was to assess the prevalence of periodontal diseases and associated risk factors in children, presenting to UBTH. **Materials and Methods:** Study participants were children aged 8-16years who presented to the Paediatric Dental clinic. Data was collected using a semi-structured questionnaire on sociodemographics, oral and general health behavior. Oral cleanliness, gingival and periodontal health were assessed using the Simplified oral health index (OHI-S), Gingival index and Community periodontal index of treatment needs (CPITN). **Results:** Seventy children participated, the highest proportion (40%) of the participants, were within 8-10 years of age, more males (52.9%), 51.4% attending secondary and 44.3% were from high socio-economic status. Toothbrush and paste (91.4%) was the predominant cleaning agents, many brushed once a day (68.6%), pain (58.6%) most frequent reason for dental visit. The prevalence of gingivitis was 82.9%. Majority had CPITN score of 2 (75.7%) indicating periodontal disease but none had periodontitis. There was an association between sexes and cleaning agents used (P= 0.025), socioeconomic status and reasons for dental visits (P= 0.018). An association exists between the presence of systemic illness and S-OHI status, Gingival index and CPITN (P= 0.001; 0.001; 0.017) respectively. **Conclusions:** Prevalence of periodontal disease was high, with a need for professional cleaning and oral health education. Risk factors were sex, socioeconomic status, use of cleaning agents; dental visits and systemic illness were significantly associated with gingivitis.

Keywords: Periodontal diseases; Gingivitis; S-OHI; CPITN; Gingival index; Risk factors

Introduction

The periodontium refers to the tissues, which surround the tooth and provides support, it consist of the gingiva, cementum, periodontal ligaments and the alveolar bone [1]. Periodontal diseases include a group of conditions common in children, adolescents and adults, which affect the tissues that make up the periodontium [2]. These diseases range from plaque induced gingivitis to periodontitis (such as aggressive periodontitis, chronic periodontitis and periodontitis as a manifestation of systemic diseases) and necrotizing periodontal diseases.

Gingivitis also known as gingival inflammation is a common form of periodontal disease seen in children and adolescents [3] and exists with varying degrees of severity.

Agbelusi and Jeboda [4] found a low prevalence of poor oral hygiene in Nigerian children, with a better oral hygiene in females than males. They also reported that boys from urban areas had good oral hygiene scores when compared to boys from rural areas.

The prevalence of destructive forms of periodontal disease is reported to be lower in children than adults. Children may also develop the severe forms of the disease [5] with aggressive periodontitis being more common in children while chronic periodontitis more common in adults [6].

The localized form of aggressive periodontitis is known to affect incisors and first molars and usually presents itself around puberty [7] and could be self-limiting. The generalized form is reported to affect at least three teeth other than the incisors and first molars.

The prevalence of this form of periodontitis is reported to be relatively low. Ranges from 0.1% to 15% and said to be greater in African American populations with 0.8% prevalence reported among Nigerians [8].

However, there is a dearth of literature on periodontal diseases among children in Southern Nigeria. The aim of this study is to assess the prevalence of periodontal diseases seen in children and adolescents presenting to the University of Benin Teaching Hospital and to report on the possible risk factors relating to it.

Materials and Methods

Study design and location

This was a Hospital based prospective cross sectional study.

Study participants were children and adolescents, aged 8-16 years, who presented to the Paediatric Dental outpatients clinic of the University of Benin Teaching Hospital, for dental treatment.

The Teaching Hospital is a tertiary institution that caters for the healthcare needs of the State (Edo) and its neighboring states.

Sample size

The sample size was calculated using the formula by Cochran [9] and based on prevalence of 0.8% reported in Lagos [8]. The sample size (N) calculated was twelve (12). However, this was increased to fifty (50) so as to allow for a more representative sample.

Sampling procedure

Study participants included patients between the ages of 8-16 years attending the Paediatric Dental out-patients clinic for dental procedures, whose parents gave their consent to participate in the study and children who gave assent to participate in the study.

Data collection

The data for each participant was collected and clinical assessment done.

It involved the use of a data collection sheet/ questionnaire.

The questionnaire comprised of:

• Demographic characteristics: sex, age, class/school attended, socioeconomic status;

• Oral health behavior: oral hygiene aids used, use of toothpaste, frequency of tooth brushing and flossing, frequency of dental visits, reasons for dental visit (preventive or curative),

• General health behavior: smoking, frequency of smoking, date of last menstrual period, pregnancy history, drug history and presence of systemic diseases.

• Measure of socio-economic status: The socioeconomic status was assessed using a multiple item index combining the mother's level of education with the father's occupation. Each child was allocated into one of five social classes (I- IV) with V being the lowest socioeconomic class [10] This index has also been applied in paediatric dental populations in Nigeria [11,12].

Clinical examination

Involved the use of the Simplified Oral hygiene index (S-OHI) by Greene and Vermillion [13] Gingival index (GI) by Loe ans Sillness [14] to assess the oral hygiene status and severity of gingivitis respectively and the Community Periodontal Index of Treatment Needs (CPITN) as outlined by Ainamo et al. (Ref No), for assessment of Periodontal Treatment Needs (TN) of the study participants

Calibration

One of the investigators (NMC) was calibrated to assess for the

Oral Hygiene status which was assessed using the Simplified Oral Hygiene Index by Green and Vermillion, Gingival index which was used to categorize patients with gingivitis, and also the Community periodontal index of treatment needs (CPITN) which was used to assess the presence of periodontal disease.

Data analysis

Data was analyzed, using IBM SPSS version 22.0. The analysis involved the assessment for any associations between the demographic characteristics, (age, sex, and socioeconomic status), oral and general health behavior and the findings of clinical examinations (oral hygiene status, gingivitis and its severity, and the Periodontal Treatment Needs). Results are presented as tables. The level of statistical significance was set at P<0.05.

Ethical considerations

Ethical approval for this study was obtained from The Ethical and Research Committee of the University of Benin Teaching Hospital before the study was commenced. The protocol as outlined by the Committee for conducting studies was strictly adhered to.

Results

A total of 70 children participated in this study. The 8-10 years age group formed the highest (40%) proportion of the population. Males (52.9%) were predominant, secondary school (51.4%) and higher socioeconomic groups (44.3%) of participants constituted the highest proportion [Table 1].

Table 1: Socio-demographic distribution of study participants.		
Variables	**Frequency (n)**	**Percentage (%)**
Age		
08-Oct	28	40
Nov-13	23	32.9
14-16	19	27.1
Sex		
Male	37	52.9
Female	33	47.1
School attended		
Primary	32	45.7
Secondary	36	51.4
University	2	2.9
Socioeconomic status		
High	31	44.3
Middle	11	15.7
Low	28	40
Total	70	100

The majority (91.4%) of the study participants used toothbrush and toothpaste only as their cleaning agents (oral prophylaxis) and the highest proportion (68.6%) clean once a day. Very few visited the dentist at least twice a year (1.4%) for regular dental checks and the most frequent reason for visiting the dentist in this study population was as a result of pain (58.6%) [Table 2].

The prevalence of cigarette smoking amongst the study participants was very low (2.9%) and the smoking ranged from occasionally to 1-5 sticks per day. None of the study participants was pregnant. About a third of the study participants were on medication (24.3%) and were mostly on Non-Steroidal

Anti-inflammatory drugs (NSAIDS) and antibiotics (7.1%) respectively. A low (11.4%) proportion of the participants gave a current history of systemic illness which ranged from asthma (4.3%), Peptic ulcer disease (2.9%), sickle cell anaemia (1.4%) and epilepsy (1.4%).

Table 2: Distribution of cleaning agents used, frequency of cleaning and dental visits and reasons for dental visits.

Variables	Frequency (n)	Percentage (%)
Cleaning agents		
Toothbrush and toothpaste only	64	91.4
Toothbrush and toothpaste with floss, toothpicks	5	7.1
Other cleaning agents such as foam, cottonwool, ash	1	1.4
Frequency of cleaning		
Once a day	48	68.6
Twice a day	22	31.4
Frequency of dental visits		
Twice a year	1	1.4
Once a year	2	2.9
Only when I have problems	30	42.9
First time	37	52.9
Reasons for dental visit		
Routine check up	4	5.7
Pain	41	58.6
To clean my teeth	12	17.1
To fill my teeth	8	11.4
Someone asked me to	3	4.3
Others (e.g accompanying a friend)	2	2.9
Total	70	100

Using the Simplified Oral Hygiene Index (S-OHI) by Greene and Vermillion, to assess the oral hygiene status of the participants, 64.3% had fair oral hygiene while 28.6% and 7.1% had good and poor oral hygiene respectively. In assessing of the prevalence of gingivitis using Gingival Index (GI) of Loe and Silness, a combined 82.9% (from mild to severe gingivitis) had inflamed gingiva. Also, an assessment of the Treatment Needs using the CPITN, 75.7% of the participants had score 2, while the others had score 1 [Table 3].

Table 3: Periodontal status of study participants using Simplified Oral Hygiene Score (S-OHI), Gingival index and Community Periodontal Index of Treatment needs (CPITN).

Variables	Frequency (n)	Percentage (%)
S-OHI		
Good	20	28.6
Fair	45	64.3
Poor	5	7.1
Gingival index		
Normal	12	17.1
Mild inflammation	43	61.4
Moderate inflammation	11	15.8
Severe inflammation	4	5.7
CPITN		
Score 1	17	24.3
Score 2	53	75.7
Total	70	100

Analysis for the association between sociodemographic variables and cleaning agents used, frequency of cleaning, frequency of dental visits and reasons for dental visits showed that there was statistically significant association between sex and cleaning agents used (P= 0.025), socioeconomic status and reasons for dental visits (P= 0.018) [Table 4].

Further analysis for the association between sociodemographic variables and periodontal status of the study participants showed no statistically significant association between the S-OHI, Gingival index and CPITN [Table 5].

Analysis for the association between the general health behavior (smoking, current medications, and presence of systemic illness) and S-OHI status, Gingival index and CPITN showed a statistically significant association between presence of systemic illness and S-OHI status, Gingival index and CPITN (P= 0.001; 0.001; 0.017) respectively [Table 6].

Discussion

A total of 71.4% of the participants had fair to poor oral hygiene status. The prevalence of gingivitis in this study population was 82.9% as assessed using the Gingival index of Loe and Silness [14] with gingivitis as the most common form of periodontal infection seen in children [2]. This is also similar to a study by Kubota et al. [15] who reported a prevalence of 84.2% in Ile-Ife and 90% in Ibadan [16].

The prevalence of periodontal disease was 75.7% using the CPITN, none of the study participants had periodontitis as all of them fell within the Treatment Needs (TN) 1 and 2 using the CPITN index, with 75.7% needing professional cleaning and oral hygiene instructions. This is comparable to a previous study [15] that reported little evidence of damage to the periodontal tissues despite high occurrence of gingivitis and heavy calculus deposits but in contrast to another which reported the presence of periodontal disease in adolescents with need for complex periodontal treatment [16]. This contrast may be attributed to the study design, as this current study was clinic based while the previous was school based. Thus dentists and dental hygienists must play a significant role in educating parents and children on the importance of oral hygiene in caries and periodontal disease prevention [2] both in clinics and the larger community.

Periodontal diseases have been reported to be more prevalent in males and increase with increasing age [17] this study found a statistically significant association between sex and cleaning agents use, with females using more cleaning agents compared with their male counterparts, this may be a pointer towards the reason for their reduced periodontal disease later in life. The reasons for dental visits and the socioeconomic status of study participants was significant as more children from the lower socioeconomic class visited the dentist as a result of pain (when symptomatic) than for routine dental checks. This corroborates the assumption that in developing countries the primary reason for dental visit is pain [18]. This may be attributed to the cost of dental treatment, or that they only present for treatment when they deem it absolutely necessary, or may also be attributed to a poor attitude to oral health and poor awareness [19].

No significant association was found between sociodemographic variables (age, sex, socioeconomic status and type of school attended) and the presence of periodontal infections, which is

Table 4: Association between socio-demographic variables and oral hygiene habits, frequency of dental visits and reasons for dental visits.

	Age					Sex				Socioeconomic status				
	8-10 n(%)	11-13 n(%)	14-16 n(%)	Total n(%)	P-value	Male n(%)	Female n(%)	Total n(%)	P-value	High n(%)	Middle n(%)	Low n(%)	Total n(%)	P-value
Cleaning agents														
Toothbrush and toothpaste	27 (42.2)	19 (29.7)	18 (28.1)	64 (100.0)	0.122	37 (57.8)	27 (42.2)	64 (100.0)	**0.025**	25 (39.1)	11 (17.2)	28 (43.8)	64 (100.0)	0.083
Toothbrush, toothpaste and other dental cleaning tools	0 (0.0)	4 (80.0)	1 (20.0)	5 (100.0)		0 (0.0)	5 (100.0)	5 (100.0)		5 (100.0)	0 (0.0)	0 (0.0)	5 (100.0)	
Others	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)		0 (0.0)	1 (100.0)	1 (100.0)		1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	
Total	28 (40.0)	23 (32.9)	19 (27.1)	70 (100.0)		37 (52.9)	33 (47.1)	70 (100.0)		31 (44.3)	11 (15.7)	28 (40.0)	70 (100.0)	
Frequency of cleaning														
Once a day	19 (39.6)	19 (39.6)	10 (20.8)	48 (100.0)	0.114	26 (54.2)	22 (45.8)	48 (100.0)	0.473	20 (41.7)	10 (20.8)	18 (37.5)	48 (100.0)	0.221
Twice a day	9 (40.9)	4 (18.2)	9 (40.9)	22 (100.0)		11 (50.0)	11 (50.0)	22 (100.0)		11 (50.0)	1 (4.5)	10 (45.5)	22 (100.0)	
Total	28 (40.0)	23 (32.9)	19 (27.1)	70 (100.0)		37 (52.9)	33 (47.1)	70 (100.0)		31 (44.3)	11 (15.7)	28 (40.0)	70 (100.0)	
Frequency of dental visits														
Twice a year	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	0.047	1 (100.0)	0 (0.0)	1 (100.0)	0.243	1 (100..0)	0 (0.0)	0 (0.0)	1 (100.0)	0.068
Once a year	0 (0.0)	1 (50.0)	1 (50.0)	2 (100.0)		1 (50.0)	1 (50.0)	2 (100.0)		2 (100.0)	0 (0.0)	0 (0.0)	2 (100..0)	
Only when I have problems	6 (20.0)	12 (40.0)	12 (40.0)	30 (100.0)		12 (40.0)	18 (60.0)	30 (100.0)		17 (56.7)	6 (20.0)	7 (23.3)	30 (100.0)	
First time	21 (56.8)	10 (27.0)	6 (16.2)	37 (100.0)		23 (62.2)	14 (37.8)	37 (100.0)		11 (29.7)	5 (13.5)	21 (56.8)	37 (100.0)	
Total	28 (40.0)	23 (32.9)	19 (27.1)	70 (100.0)		37 (52.9)	33 (47.1)	70 (100.0)		31 (44.3)	11 (15.7)	28 (40.0)	70 (100.0)	
Reasons for dental visits														
Routine check up	1 (25.0)	2 (50.0)	1 (25.0)	4 (100.0)	0.776	2 (50.0)	2 (50.0)	4 (100.0)	0.398	4 (100.0)	0 (0.0)	0 (0.0)	4 (100.0)	0.018
Pain	15 (36.6)	14 (34.1)	12 (29.3)	41 (100.0)		21 (51.2)	20 (48.8)	41 (100.0)		17 (41.5)	5 (12.2)	19 (27.1)	41 (100.0)	
To clean my teeth	5 (41.7)	3 (25.0)	4 (33.3)	12 (100.0)		5 (41.7)	7 (58.3)	12 (100.0)		7 (58.4)	1 (8.3)	4 (33.3)	12 (100.0)	
To fill/ arrange my teeth	4 (50.0)	2 (25.0)	2 (25.0)	8 (100.0)		4 (50.0)	4 (50.0)	8 (100.0)		3 (37.5)	4 (50.0)	1 (12.5)	8 (100.0)	
Someone asked me to	1 (33.3)	2 (66.7)	0 (0.0)	3 (100.0)		3 (100.0)	0 (0.0)	3 100.0)		0 (0.0)	0 (0.0)	3 (100.0)	3 (100.0)	
Others	2 (100.0)	0 (0.0)	0 (0.0)	2 (100.0)		2 (100.0)	0 (0.0)	2 (100.0)		0 (0.0)	1 (50.0)	1 (50.0)	2 (100.0)	
Total	28 (40.0)	23 (32.9)	19 (27.1)	70 (100.0)		37 (52.9)	33 (47.1)	70 (100.0)		31 (44.3)	11 (15.7)	28 (40.0)	70 (100.0)	

Table 5: Association between socio-demographic variables and Periodontal status of study participants assessed using S-OHI, Gingival index and CPITN.

	Age					Sex				Socioeconomic status				
	8-10 n(%)	11-13 n(%)	14-16 n(%)	Total n(%)	P-value	Male n(%)	Female n(%)	Total n(%)	P-value	High n(%)	Middle n(%)	Low n(%)	Total n(%)	P-value
S-OHI														
Good	7 (35.0)	7 (35.0)	6 (30.0)	20 (100.0)	0.692	7 (35.0)	13 (65.0)	20 (100.0)	0.107	13 (65.0)	4 (20.0)	3 (15.0)	20 (100.0)	0.091
Fair	18 (40.0)	14 (31.1)	13 (28.9)	45 (100.0)		26 (57.8)	19 (42.2)	45 (100.0)		17 (37.8)	6 (13.3)	22 (48.9)	45 (100.0)	
Poor	3 (60.0)	2 (40.0)	0 (0.0)	5 (100.0)		4 (80.0)	1 (20.0)	5 (100.0)		1 (20.0)	1 (20.0)	3 (60.0)	5 (100.0)	
Total	28 (40.0)	23 (32.9)	19 (27.1)	70 (100.0)		37 (52.9)	33 (47.1)	70 (100.0)		31 (44.3)	11 (15.7)	28 (40.0)	70 (100.0)	
Gingival index score														
Normal gingiva	4 (33.3)	3 (25.0)	5 (41.7)	12 (100.0)	0.436	4 (33.3)	8 (66.7)	12 (100.0)	0.473	6 (50.0)	3 (25.0)	3 (25.0)	12 (100.0)	0.807

Mild inflammation	15 (34.9)	17 (39.5)	11 (25.6)	43 (100.0)	24 (55.8)	19 (44.2)	43 (100.0)	18 (41.9)	6 (14.0)	19 (44.1))	43 (100.0)	
Moderate inflammation	6 (54.5)	2 (18.2)	3 (27.2)	11 (100.0)	7 (63.6)	4 (36.4)	11 (100.0)	6 (54.5)	1 (9.1)	4 (36.4)	11 (100.0)	
Severe inflammation	3 (75.0)	1 (25.0)	0 (0.0)	4 (100.0)	2 (50.0)	2 (50.0)	4 (100.0)	1 (25.0)	1 (25.0)	2 (50.0)	4 (100.0)	
Total	28 (40.0)	23 (32.9)	19 (27.1)	70 (100.0)	37 (52.9)	33 (47.1)	70 (100.0)	31 (44.3)	11 (15.7)	28 (40.0)	70 (100.0)	
CPITN score												
Score 1	9 (52.9)	5 (29.4)	3 (17.6)	17 (100.0)	7 (41.2)	10 (58.8)	17 (100.0)	8 (47.1)	2 (11.8)	7 (41.2)	17 (100.0)	0.874
Score 2	19 (35.8)	18 (34.0)	16 (30.2)	53 (100.0) 0.413	30 (56.6)	23 (43.4)	53 (100.0) 0.203	23 (43.4)	9 (17.0)	21 (39.6)	53 (100.0)	
Total	28 (40.0)	23 (32.9)	19 (27.1)	70 (100.0)	37 (52.9)	33 (47.1)	70 (100.0)	31 (44.3)	11 (15.7)	28 (40.0)	70 (100.0)	

Table 6: Association between general health behavior (smoking, medications, types of medications and presence of systemic illness) and S-OHI status, Gingival index and CPITN.

	S-OHI					Gingival index						CPITN			
	Good n(%)	Fair n(%)	Poor n(%)	Total n(%)	P-value	Normal n(%)	Mild inflam-mation n(%)	Moder-ate inflam-mation n(%)	Severe inflam-mation n(%)	Total n(%)	P-value	Oral hygiene instructions n(%)	Profes-sional cleaning and OHI n(%)	Total n(%)	P-value
Smoking															
Yes	0 (0.0)	2 (100.0)	0 (0.0)	2 (100.0)	0.564	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	2 (100.0)	0.731	0 (0.0)	2 (100.0)	2 (100.0)	0.571
No	20 (29.4)	43 (63.2)	5 (7.4)	68 (100.0)		12 (17.6)	41 (60.3)	11 (16.2)	4 (5.9)	68 (100.0)		17 (25.0)	51 (75.0)	68 (100.0)	
Total	20 (28.6)	45 (64.3)	5 (7.1)	70 (100.0)		12 (17.1)	43 (61.4)	11 (15.7)	4 (5.7)	70 (100.0)		17 (24.3)	53 (75.7)	70 (100.0)	
Systemic illness															
Yes	3 (37.5)	2 (25.0)	3 (37.5)	8 (100.0)	0.001	2 (25.0)	2 (25.0)	1 (12.5)	3 (37.5)	8 (100.0)	0.001	5 (62.5)	3 (37.5)	8 (100.0)	0.017
No	17 (27.4)	43 (69.4)	2 (3.2)	62 (100.0)		10 (16.1)	41 (66.1)	10 (16.1)	1 (1.6)	62 (100.0)		12 (19.4)	50 (80.6)	62 (100.0)	
Total	20 (28.6)	45 (64.3)	5 (7.1)	70 (100.0)		12 (17.1)	43 (61.4)	11 (15.7)	4 (5.7)	70 (100.0)		17 (24.3)	53 (75.7)	70 (100.0)	
Currently on medication															
Yes	6 (35.3)	10 (58.8)	1 (5.9)	17 (100.0)	0.775	4 (23.5)	9 (52.9)	3 (17.6)	1 (5.9)	17 (100.0)	0.837	5 (29.4)	12 (70.6)	17 (100.0)	0.394
No	14 (26.4)	35 (66.0)	4 (7.5)	53 (100.0)		8 (15.1)	34 (64.2)	8 (15.1)	3 (5.7)	53 (100.0)		12 (22.6)	41 (77.4)	53 (100.0)	
Total	20 (28.6)	45 (64.3)	5 (7.1)	70 (100.0)		12 (17.1)	43 (61.4)	11 (15.7)	4 (5.7)	70 (100.0)		17 (24.3)	53 (75.7)	70 (100.0)	

similar to another study [16] and in contrast to that reported in Sudan [20]. The explanation for this finding may be due to the small sample size of this study population and thus should be extrapolated to the larger population with caution; differences may be noted if the sample size is increased.

Some systemic illnesses have been categorized as risk factors for periodontal diseases as it affects the host response to the plaque biofilm, upsetting the host-microbial balance [21-23] while others have been categorized as risk indicators which are biologically plausible causative agents for the disease, these include some infections or diseases with no current biological plausibility but has been associated with periodontal disease [22].

Though this study reported no periodontitis in this study population it found a statistically significant association between the presence of systemic illness (asthma, Peptic ulcer disease, sickle cell anaemia and epilepsy) and S-OHI status, gingival index and CPITN. Thus there was significant increase in gingivitis among participants with a form of systemic illness. This gingivitis may just be a pointer to the early onset of periodontitis if not managed properly.

Conclusion

The prevalence of periodontal disease in this population was high with an increased need for professional cleaning and oral hygiene instructions. Oral education and regular dental cleaning is important to meet the treatment needs of this population. Risk factors such as sex and socioeconomic status were significantly associated with cleaning agents used and reasons for dental visits. Children with systemic illness also need to have more regular dental visits and professional cleaning as this predisposes them to poor periodontal health.

However, due to the limitations of this study, there is need for larger community based study to determine the prevalence and risk factors of periodontal diseases in children in this study environment.

Conflict of Interest

All authors disclose that there was no conflict of interest.

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