Pattern and surface prevalence of dental caries on posterior teeth of children in a Nigerian Teaching Hospital.

***Popoola Bamidele . O[1], BDS(IB),FWACS.**
****Denloye Obafunke . ,BDS(LAGOS),FWACS.**
Department of Child Oral Health, University College Hospital Ibadan, Nigeria.[1]

***Correspondence to: Dr Bamidele O. Popoola.**
E-mail: drbukolapopoola@yahoo.com

Abstract

Objective: Knowledge of the pattern of dental caries in children is important in the designing of preventive clinical procedures, community-based programmes and formulation of appropriate treatment strategies for these children. This study therefore described the pattern and surface prevalence of dental caries on the posterior teeth of children attending Paedodontic clinic of University College Hospital, Ibadan, Nigeria.
Materials and methods: All children aged 5 – 12 years attending the clinic for the first time within a period of 24 months (2005-2007) were examined clinically and radiographically (using bitewing radiographs) for dental caries. Tooth types and tooth surfaces affected were recorded and data was analysed using Statistical Package for Social Sciences (SPSS) version 11.
Results: The results showed that the most frequently affected tooth surface in primary teeth was approximal surface(58.6%) followed by occlusal surface(39.9%) while in permanent teeth reverse was the case (occlusal = 77.0% , approximal =15.0%). The second primary molars were found to be more affected than first molars in primary dentition while first permanent molars were the most affected in permanent teeth. The distribution of dental caries was higher in the lower jaw than the upper jaw. There was a slight difference in sex predilection with females having higher mean dmft/DMFT than males, though this was not statistically significant. The age group mostly affected was 5-8years with mean dmft and DMFT of 2.68 + 1.84 and 0.21 + 0.54 respectively. .
Conclusion: In conclusion, the high occurrence of approximal caries in primary teeth observed revealed the need for the use of bitewing radiographs for early detection of such lesions while the high occurrence of occlusal caries in permanent dentition showed the need to design preventive clinical procedures such as the placement of fissure sealants on first molars so as to prevent occurrence of occlusal caries in high risk children.

Key words: Dental caries, surface prevalence, posterior teeth, children.

Introduction

Dental caries is a dynamic process involving interplay between demineralization and remineralization of tooth tissue. The impact of dental caries on the well-being of children has been documented (1). The study found that functioning dentition is needed during the period of growth and development of a child and once posterior teeth become carious, eating preference, choice of food and quantity of food eaten will be affected. Consequently growth, development and overall quality of life of affected young children will be retarded (1).
Peterson(2),in his review of various studies on dental caries observed a decline in the prevalence of caries in developed countries while an increase in prevalence was observed in some developing countries. In Nigeria, previous epidemiological studies showed a low prevalence of caries among Nigerian children (3, 4), however an increase in prevalence are being observed recently due to increase in cariogenic diet consumption coupled with poor oral health awareness(5,6). Ismail et al (7) in a study suggested that to counteract the potential increase in the prevalence of dental caries in developing countries, preventive and oral health promotion programmes should be planned, implemented and targeted at those at greatest risk. . The tooth surfaces on which dental plaque easily accumulates are the areas most prone to caries attack (8). Due to the presence of occlusal tables with pits and fissures on posterior teeth (molars and premolars), these teeth are more prone to developing caries than anterior teeth (incisors and canines) (9).
In line with this, the knowledge about the most affected teeth and surfaces can contribute to the design of preventive clinical procedures, community-based programmes and formulation of appropriate treatment strategies for these children. In this way resources can be targeted at teeth and surfaces at high risk. Researches on dental caries in this country most often focuses on epidemiological data with respect to incidence and prevalence (3, 4, 5, 6). Since little attention has been paid to establish the pattern of dental caries on the individual teeth and surfaces, the aim of this study therefore was to

establish the pattern and surface prevalence of dental caries on posterior teeth among children aged 5 to 12 years attending the Paedodontic Clinic of the University College Hospital Ibadan.

Material and methods

This was a cross-sectional study in which all patients aged 5 – 12 years that presented for the first time in the Paedodontic Clinic, University College Hospital Ibadan, within a period of 24 months were examined clinically and radiographically for dental caries on their posterior teeth. Parental consent for routine clinical and radiographic examination was obtained before dental examination for each patient. Approval for the study was obtained from UI/UCH Ethical Review Committee.

Clinical examination of each child was carried out independently by the investigators (B.O and O.O) using World Health Organization (10) criteria for diagnosis of caries. This involved sitting each patient on the dental chair and examining the posterior teeth of each child using sterile mouth mirrors and CPI probes(10) (community periodontal Index probe) under the illumination attached to each chair. All surfaces (occlusal, interproximal, buccal and lingual) of each tooth were examined and the surfaces affected by caries were noted and recorded. When a tooth has one or more restoration on it, it was recorded as "filled" tooth. However, a tooth was considered "missing" due to caries when it was extracted as a result of caries. However, for missing primary teeth, they were not considered missing due to caries until when normal exfoliation would not be a sufficient explanation for its absence in that age.

A set of standard posterior bitewing radiographs(11) were then taken by one of the investigators (B.O)for each child previously examined clinically for diagnosis of caries on occlusal and approximal surfaces which might have been missed clinically. Radiographic appearance of caries was scored by the investigators based on mutual agreement. Caries level in primary teeth (dmft) and permanent teeth (DMFT) were recorded based on clinical and radiographic findings.

The intra and inter-examiner reliability (kappa) of clinical examination and radiographic assessment for caries were determined using the first 20 children for clinical examination and 20 sets of randomly selected bitewing radiographs for the radiographic examinations. Weighted kappa scores were estimated based on duplicate recordings using SPSS (version 11.0).

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 11.0. Frequency tables of variables were generated while Student t test was used to compare the means between continuous variables in the data. Statistical significance set at $p \leq 0.05$.

Results

During the 24- months study period, a total of 172 children, within the age range of 5-12 years attending the Paedodontic Clinic UCH, Ibadan for the first time were seen.

A high percentage of the subjects (73.8%) had dental caries while 26.2% were caries free. Of 127 children with dental caries, 69 (54.3%) were male while 58 (45.7%) were female.

From Table 1 many of the children had decayed teeth but the mean dmft and DMFT for both genders were not

Table 1: Gender distribution of decayed, missing and filled primary and permanent teeth on clinical and radiographical examination.

		Primary Teeth					Permanent Teeth				
Gender	n	Decayed "d"	Missing "m"	Filled "f"	Total dmft	Mean dmft	Decayed "D"	Missing "M"	Filled "F"	Total DMFT	Mean DMFT
Male	69	134	4	-	138	2.00 ±1.81	40	1	-	41	0.59 ±1.16
Female	58	127	5	-	132	2.28 ±1.59	34	-	-	34	0.59 ±1.39
Total	**127**	**261**	**9**	**-**	**270**	**2.13 ± 1.71**	**74**	**1**	**-**	**75**	**0.59 ±1.50**
		t = 0.90: P value= 0.37					t = 0.04: P value = 0.97				

dmft = decayed, missing and filled primary teeth.

DMFT = decayed, missing and filled permanent teeth.

Table 2: Age range distribution of decayed, missing and filled primary and permanent teeth on clinical and radiographic examination.

		Primary teeth					Permanent teeth				
Age range (years)	N	Decayed "d"	Missing "m"	Filled "f"	Total dmft	Mean dmft	Decayed "D"	Missing "M"	Filled "F"	Total DMFT	Mean DMFT
5-8	77	198	8	-	206	2.68 ±1.84	16	-	-	16	0.21± 0.54
9-12	50	63	1	-	64	1.28 ±1.40	58	1	-	59	1.18 ± 1.35
Total	127	261	9	-	270	2.13 ±1.71	74	1	-	75	0.59± 1.50
		t = 3.63; P value = 0.001			t= 4.47; P value=0.001		t= 4.47; P value=0.001				

dmft = decayed, missing and filled primary teeth.
DMFT= decayed, missing and permanent teeth.

Table 3: Surface prevalence of caries in primary teeth on clinical and radiographic examinations according to tooth type

		Distribution of caries on examined surfaces Approximal				
Tooth type	No. of carious teeth "n"	Occlusal surface caries	Mesial surface caries	Distal surface caries	Buccal surface caries	Lingual surface caries
54	17	6	-	7	-	-
55	28	17	9	-	1	-
64	15	6	-	9	-	-
65	27	12	13	-	1	-
74	38	11	2	22	-	-
75	45	19	19	3	-	-
84	42	8	2	37	1	-
85	49	24	30	-	2	-
Total	**261**	**103**	**75**	**78**	**5**	**-**

n = number of carious posterior primary teeth found on clinical and radiographic examinations.

significant. A higher mean dmft (2.68 + 1.84) was observed in the 5-8 years age group than the 9-12 year old and this difference was statistically significant while the reverse was observed in the permanent dentition between the two age groups and this was also statistically significant (Table 2).

On clinical and radiographic examinations, 261 posterior primary teeth (54.3%) and 74 posterior permanent teeth (39.8%) were found carious. The teeth mostly affected were the lower primary and permanent molars. Tables 3 and 4 show surface distribution of caries on the primary and permanent teeth according to tooth types.

Out of the total number of carious primary teeth, 103 (39.9%) were occlusal surface caries, 153 (58.6%) were approximal surface caries i.e mesial and distal surface caries, while 5 (1.9%) were buccal surface caries. Hence, approximal caries was more prevalent in primary teeth in this study. The teeth mostly affected by approximal caries were lower primary molars, while the surfaces mostly affected in approximal caries were distal surfaces of first primary molars and mesial surfaces of second primary molars (Table 3).

Out of the 74 carious posterior permanent teeth found, 57 (77.0%) were occlusal surface caries, 15 (20.3%) were approximal surface caries, while only 2 (2.7%) were buccal surface caries (Table 4). The mostly affected teeth were the lower first permanent molars. Lingual surface caries were not found in both primary and permanent teeth.

The weighted Kappa scores for both intra and inter-examiner variabilities were 0.920 and 0.942 respectively. These showed a good level of agreements in the findings of the investigators.

Discussion

This crossectional study examined caries pattern on posterior teeth of children aged 5 – 12 -years at the Paedodontic Clinic, University College Hospital (UCH) Ibadan, Nigeria. In this study, it was found that the frequently affected site on primary dentition was approximal surface (58.6%) while occlusal surface caries accounted for 39.5% of carious primary teeth found. A higher prevalence of approximal caries in primary dentition

Table 4: Surface prevalence of caries in permanent teeth on clinical and radiographic examinations according to tooth type

Tooth type	No. of carious teeth "n"	Distribution of caries on examined surfaces Approximal Occlusal surface caries	Mesial surface caries	Distal surface caries	Buccal surface caries	Lingual surface caries
16	12	11	-	1	-	-
17	-	-	-	-	-	-
26	16	13	1	-	-	-
27	1	1	-	-	-	-
36	20	13	6	-	1	-
37	1	1	-	-	-	-
46	24	18	5	2	1	-
47	-	-	-	-	-	-
Total	**74**	**57**	**12**	**3**	**2**	**-**

n = number of carious posterior permanent teeth found on clinical and radiographic examinations

observed in the present study was in agreement with an earlier report (12). Stecksen and Wahlin(12) observed that the occlusal surface is the most susceptible to dental caries in the preschool age of 3-5 years and this was attributed to the anatomy of pits and fissures. But with the eruption of first permanent molars at age 6, the normally occurring developmental spaces of primary dentition begin to close. With this space closure and the formation of contact areas, the incidence of approximal caries greatly increases. This therefore explained their observation of an increase in the incidence of approximal caries from 32% in 4 year-olds to 91% in 6 year-olds which was attributed to low, broad and flat contact areas of primary molars that favoured deposition of plaque.

The distal surfaces of first primary molars and mesial surface of second primary molars were observed to be the surfaces mostly affected in the present study. Volker and Russell(13) observed a similar distribution. The authors analyzed the relative caries susceptibility of approximal surfaces in primary dentition and a general trend of increased caries incidence in a distal direction was observed. Thus, the canine-first molar contact area is less susceptible than the first molar-second molar contact area. This was attributed to an increase in areas of contact between those teeth along a distal direction. On clinical and radiographic examination, lower second primary molars were more affected by caries than the first primary molars. This higher susceptibility of the lower second primary molars to caries was attributed to its having a broader occlusal table with more pits and fissures and also a wider contact area proximally than the first primary molar(9).

However, in permanent dentition, it was found that the most frequently affected site was occlusal surface (77.0%) while only 20.3% accounted for approximal caries in them. The first permanent molars were more affected by caries than the second permanent molars in the present study, which was in accordance with previous studies (14, 15). The first permanent molar erupts about six years earlier than the second permanent molar, this may therefore make it more vulnerable to caries attack because of longer period of exposure to oral condition than the second molar. Similarly, it was also observed in this study that lower primary and permanent molars were more affected by caries than their upper counterparts. This finding is similar to reports from previous studies (16, 17). The explanation for this arch difference in caries susceptibility was attributed to the morphological differences in pits and fissures on molar teeth which make mandibular teeth more prone to caries. Earlier eruption of teeth in the mandibular arch may also account for this disparity (9). Other explanation may possibly be due to gravitational effect on teeth in the mandibular arch.

In this study, higher mean dmft/ DMFT values were observed in female children compared with that of male children. This finding is in accordance with previous studies on caries(18,19) .This observation was attributed to a number of reasons, which include early teeth eruption in girls compared to that in boys, difference in dietary pattern between boys and girls with an observed frequent snacking habit with cariogenic foods in girls than in boys (20).

Age has been identified as a factor affecting caries prevalence. In this study, the age group mostly affected by caries was the 5-8 years with mean dmft of 2.68 + 1.84 but lower mean DMFT which may be due to the fact that permanent teeth were fewer and recently erupted in such age group, hence too early to be affected by dental caries. However the higher mean DMFT observed in age 9-12 years was in line with previous studies (3, 21) where it was observed that prevalence of dental caries increases with age. Daniel (21), observed that in ages 5-19 years children studied, the mean DMFT increases gradually with age and reaches a peak mean DMFT of 2.9 at 14 years. The author however observed that between ages 15 and 19 years, the mean DMFT did not vary much and was found to be 2.4. Similarly, in another study, the mean DMFT of 0.7 and 1.3 were reported for subjects aged 12 and 15 years old respectively (3).

Conclusion

In conclusion, the pattern of dental caries observed in primary teeth varied from what was found in permanent teeth with a high occurrence of approximal caries in primary teeth than occlusal caries while a reverse i.e. high occurrence of occlusal caries than approximal caries was found in the permanent dentition.

Recommendations:

· As a result of high occurrence of approximal caries observed in primary teeth, there is the need for regular use of bitewing radiographs for early detection of such lesions in children.

· Also, the high occurrence of occlusal caries in permanent dentition showed the need to design preventive clinical procedures such as the placement of fissure sealants on first molars so as to prevent occurrence of occlusal caries in high risk children and designing Community based programmes that include dental health education which will encourage asymptomatic dental visit.

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