

Dental caries prevalence and bilateral occurrence in premolars and molars of adolescent school children in Ibadan, Nigeria

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Abstract

The aim of the study was to determine the prevalence of dental caries in premolars and molars of adolescent school children in Ibadan, Nigeria with a view of comparing findings from this study with previous African studies.

A cross section of 12-19 year-old school children from the five local government areas in Ibadan were examined over a period of three months by two examiners (OD and DA), using the WHO criteria for diagnosing dental caries. Only premolars and molars were examined but the third molars were excluded because they were not fully erupted in most children.

The mean age of the children under study was $16,2 \pm 0,83$ years. Dental caries was detected in 10.8% of the children. Overall, 225 teeth had dental caries, out of which 13.3% were premolars while 86.67% were molars. Among the molars, first molars were mostly affected by caries (68.72%) while 31.28% second molars were affected. Second premolars were more affected by caries among the premolars. Also bilateral caries occurrence was highest in the mandibular first molars. In conclusion since the first molars were the most vulnerable teeth to decay, caries preventive programs on them need to be drawn up.

Résumé

Prévalence de la carie dentaire et atteinte bilatérale des prémolaires et des molaires chez des élèves à Ibadan (Nigéria)

L'objectif de cette étude était de déterminer la prévalence de la carie dentaire sur les prémolaires et les molaires d'élèves à Ibadan (Nigéria) dans le but de comparer les résultats de cette étude avec les précédentes études africaines.

Une étude transversale réalisée auprès des élèves âgés de 12 à 19 ans dans les cinq zones d'administration locale d'Ibadan a été réalisée. Les élèves ont été examinés sur une période de trois mois par les deux examinateurs (OD et DA), en utilisant les critères de l'OMS pour le diagnostic de la carie dentaire. Seules les prémolaires et les molaires ont été examinées, les troisièmes molaires ont été exclues parce qu'elles n'étaient pas complètement sorties chez la plupart des enfants.

L'âge moyen des enfants à l'étude était de $16,2 \pm 0,83$ ans. La carie dentaire a été détectée chez 10,8% des enfants. Au total, 225 dents étaient cariées, dont 13,3% étaient des prémolaires et 86,67% étaient des molaires. Parmi les molaires, les premières molaires étaient les plus atteintes par les caries (68,72 %) alors que les deuxièmes molaires étaient atteintes dans 31,28% des cas. Parmi les prémo-

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lares, les deuxièmes prémolaires étaient les plus atteintes. L'apparition de caries bilatérales était également plus élevée sur les premières molaires mandibulaires. En conclusion, les premières molaires étaient les dents plus vulnérables à la carie. Des programmes de prévention contre la carie dentaire devraient être mis en place.

Introduction

Dental caries and its sequelae have been reported as one of the most highly prevalent diseases in children (1). Earlier reported studies have indicated dental caries as the major cause of tooth loss in Nigerian children (2). The pattern of distribution of dental caries varies according to community and individual life-style. Whilst there is a general downward trend of caries prevalence in developed countries, developing nations are experiencing an upsurge in caries attributable mainly to increasing sugar consumption (3). An upward trend in dental caries prevalence and severity among Nigerians adolescents has been reported (4). The vulnerability of the first or second permanent molars has been a focus of caries research for decades (5-10). Earlier Ugandan and Nigerian studies on tooth vulnerability to decay reported second permanent molars as being more vulnerable to caries attack than the first permanent molars with the DMFT of second permanent molars almost twice that of first permanent molars (5, 7), while on the contrary, the first permanent molars were more prone to caries attack than the second permanent molars in children from developed countries (1, 8) and this finding is in agreement with a more recent study (10). Among the premolars, LOTO (11) reported the second premolars as been more prone to caries attack than the first premolars irrespective of the jaw involved. Studies on bilateral occurrence of dental caries have been reported (1, 12). WYNE (1) in an earlier study, found that among 12-13 years-old maxillary first molars followed by mandibular first molars showed high caries bilaterality while among the 15-19 years-old, mandibular

first molars followed by maxillary first molars and mandibular second molars showed high caries bilaterality.

The purpose of this study was to determine the prevalence and bilateral occurrence of dental caries in premolars and molars of 12-19 year-old school children in Ibadan, Nigeria with a view of comparing findings with previous studies, as information about caries pattern will assist in the formulation of preventive strategies to be adopted for adolescents who may have higher caries prevalence as a result of their frequent snacking habit.

Patients and method

This was a cross sectional study conducted between September and November 2010 among senior secondary school students in Ibadan, Nigeria.

Ibadan is a town in the South Western part of Nigeria with a population of about 2.5 million. A list of public secondary schools was obtained from Ministry of Education from which 11 senior secondary schools were selected using a proportionate sampling method based on each school population.

At the respective schools, an average of about 100 students were randomly selected ensuring an equal mix of the sexes.

Permissions to exam the children were obtained from the state Ministry of Education and the principals of each school and only students who consented to be examined were included in the study

At the respective schools, intra oral examinations were conducted outdoor, under natural light by the authors. Dental caries was diag-

Table 1:
Tooth specific caries prevalence in the maxilla and mandible

($\chi^2 = 40.98$; $p < 0.0001$)

Tooth type	Maxillary (%)	Mandibular (%)	Total (%)
First premolar	7 (10.15)	6 (3.85)	13 (5.78)
Second premolar	7 (10.15)	10 (6.41)	17 (7.56)
First molar	41 (59.42)	93 (59.61)	134 (59.56)
Second molar	14 (20.29)	47 (30.13)	61 (27.11)
Total	69 (100.0)	156 (100.0)	225 (100)

Table 2: Caries distribution according to quadrants

Tooth type	Upper and lower right quadrant	Upper and lower left quadrant	Total
First premolar	5 (4.39)	8 (7.21)	13 (5.78)
Second premolar	10 (8.77)	7 (6.31)	17 (7.56)
First molar	67 (58.77)	67 (60.36)	134 (59.56)
Second molar	32 (28.07)	29 (26.13)	61 (27.11)
Total	114 (100)	111 (100)	225 (100)

($\chi^2 = 3.21$, $P = 0.360$)

nosed if frank cavitation was observed (13) on any of the premolars or molars. Third molars were excluded from the study because they had not erupted in most of the children in the study. All the children who required dental treatments were referred to the dental clinic for management. All the children received oral health education with explicit oral hygiene instructions. Statistical analysis was performed using SPSS version 16.0. Descriptive statistics was employed and differences were considered statistically significant at $p < 0.05$ level.

Results

A total of 1,147 senior secondary school students were examined during the period of study. Their age ranged between 12 and 19 years. Their mean age was 16.2 ± 0.83 years. One hundred and twenty four children (10.8%) had experienced dental caries as expressed by the DMFT index on either a premolar or a molar with a male to female ratio of 1:1.5.

Overall, 225 teeth were involved, out of which 30 were premolars (13.3%) and 195 teeth were molars (86.7%) with a premolar: molars ratio of 1:6.5. Table 1 shows the tooth type affected according to the jaws.

Mandibular premolars and molars were more vulnerable to caries attack than their maxillary counterparts with a ratio of 2.3:1. First molars in both jaws recorded highest number of teeth affected by caries. They were followed by the second molars, while among the premolars the second premolars were more affected than the first premolars in a ratio of 1.3:1. This difference in tooth type affected was found to be highly significant.

As shown in Table 2, upper and lower right quadrants recorded higher number of carious teeth than the left side although this difference was not significant ($\chi^2 = 3.21$, $P = 0.36$). Bilateral caries occurrence was found in 22.54% of cases and mandibular first molars showed the highest caries bilaterally (55.5 %) (Table 3).

Table 3:
Percentage
distribution of bilateral
caries occurrence

Tooth type	Maxillary %	Mandibular %
First premolar	2.78	-
Second premolar	-	-
First molar	5.56	55.56
Second molar	11.11	25.0

This was followed by mandibular second molars (25 %) while maxillary first premolars had the least bilateral occurrence (2.78%). There were no bilateral caries occurrence in mandibular premolars and maxillary second premolars.

Discussion

Molars and premolars are important members of the permanent dentition with respect to mastication. The first permanent molar in particular is the key to the permanent occlusion of the teeth. It plays a very important role in the establishment and function of occlusion of the permanent dentition. While positions of the premolars are used in the determination of Pont index for the purpose of orthodontic and prosthodontic management (11). Although caries prevalence in the present study is low, adolescence is known to be a time of heightened caries activity for many persons as a result of increased intake of cariogenic substances and poor attention to oral hygiene procedures (14). Therefore an analysis of this pathological condition on molars and premolars should be of interest to dentists managing adolescent children. The low prevalence of dental caries might be due to absence of the use of radiographs in the study since this was an epidemiological study.

This study has shown that molars are more vulnerable to caries attack than premolars in a ratio of 6.5:1. This is a reflection of the morphological difference in the anatomical configuration between molars and premolars.

Molars have a larger occlusal table with more

fissures and fossae. Therefore there is a tendency for retention of food as well as more difficulty in plaque removal.

First permanent molars were chiefly attacked by caries. This observation is in agreement with some earlier studies (10, 15, 16, 17).

Contrary to this observation however, previous African studies observed that second permanent molars were more vulnerable to dental caries than first permanent molars (7, 12).

JENSEN et al. (5) reported that among Ugandan children, approximately twice as many second permanent molars as first permanent molars were observed to be carious after the age of 11 years.

Similarly, AKPATA and JACKSON (7) reported that caries prevalence in second permanent molars was approximately twice that in first permanent molars in 15 to 21 year old urban Nigerians. Increased solubility of the second permanent molars was a reason postulated for this pattern of caries vulnerability in these previous studies as the mineralization of one tooth type is different from that of the other (7). The higher caries prevalence on first permanent molars observed in the present study may be attributed to earlier enamel maturation and eruption of first permanent molars compared with second permanent molars as first molars erupt at least six years earlier than second permanent molars. Eruptions of first permanent molar occur between ages six and seven years while that of second permanent molars occur between ages twelve and fourteen years. It is therefore not surprising that the first molar been the oldest tooth among molars and premolars, was the most affected in both jaws. An earlier study has shown that the greatest vulnerability of teeth to caries attack usually occurs during the first four years of eruption with the maximum peak at the second year of eruption period (18).

This also might explain the higher vulnerability of the first permanent molars to caries attack

since dental caries becomes clinically evident over a period of time because it is a slow growing lesion. The vulnerability of the second premolars among all premolars to caries attack is in agreement with a previous study (11). This has been explained in terms of the sandwiching of the second premolars between the first premolar and first permanent molars during eruption with a possibility of greater tendency of plaque and debris accumulation on the erupting second premolars (11).

Generally, caries prevalence was quite similar in both the right and left sides of the mouth in the set of teeth under study, although the distribution was slightly more on the right than the left side of the mouth. This observation is in agreement with previous studies (1, 11).

Similar caries prevalence on both sides of the mouth has been shown to indicate a high bilateral occurrence of caries (1).

However, bilateral caries occurrence was highest in mandibular first molars and this was

followed by mandibular second molars. This bilateral occurrence requires attention during routine dental examination should include a careful clinical and radiographic examination to rule out caries on the contra lateral side especially when there is no obvious cavitation. It also demands careful prevention strategies which include fissure sealing of first molars, topical fluoride application and meticulous home care. The low bilateral caries occurrence in premolars could be related to low caries prevalence generally in these teeth.

Adolescence is a time of heightened caries activities for many persons as a result of increased intake of cariogenic diets and inattention to oral hygiene care procedures. In conclusion, it is important to draw up caries preventive programs which may include fissure sealing for this group of young adults with special consideration for the first permanent molars which were found to be the most vulnerable teeth to decay.

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