DENTAL CARIES ON PERMANENT DENTITION IN PRIMARY SCHOOL CHILDREN – NDOLA, ZAMBIA, 2017

RESEARCH ARTICLE

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Dental caries is a major oral health problem affecting 60-90% of children in developing countries [1]. This study aimed to determine the prevalence of caries and associated factors in permanent dentition among primary school children. A cross sectional study was conducted using a modified 2007 WHO questionnaire and a 1997 WHO oral health survey clinical examination tool. Ethical approval and permission to conduct the study were obtained from relevant authorities. The Chi-squared test was used to determine associations, with the level of significance set at the 5%. A total of 365 children were enrolled of which 48.5% were males. The age range was 5-17 years. The overall prevalence of caries in permanent teeth was 47(12.9 %). Geographical location (p=0.022) and family income (p= 0.014) were significantly associated with caries, although only family income was statistically significant (odds ratio [OR] = 0.65, 95% confidence interval [CI] = 0.46 - 0.92) in a multivariate analysis. The lower left first molar (9.0%) was the most often affected. None of the children had a tooth with a filled cavity. Less than half, 177 (48.5%), brushed their teeth for 2 or more minutes daily and only 71 (19.5%) had been for a dental check-up. Promotion of regular dental check-ups in schools and application of fissure sealants to children at high risk of developing caries is recommended.

Introduction

Dental caries is a progressive and irreversible microbial disease that affects calcified dental hard tissues. Cariogenic bacteria, fermentable carbohydrates, susceptible teeth, and time are the key etiological factors [2]. Carries occurs when organic acids resulting from metabolism of sugars by bacteria in dental plaque cause a loss of minerals in enamel and dentine resulting in a cavity [3]. Most decay is untreated in most developing countries [4,5], affecting the growth and wellbeing of millions of children [6,7]. Most African countries, including Zambia, have a poor dentist: population ratio of 1:150,000 compared with 1:2000 in most industrialized countries [8].

A study in West Bengal, India, showed a significant higher prevalence of caries on permanent dentition in girls (30.9%) than boys (25.4%) [9]. A similar study in India also showed 73.5% in girls and 26.2% in boys [10]. The higher prevalence in girls could be associated with earlier eruption of permanent teeth in females than males [11,12]. However, another study [13] reported a higher prevalence of caries in boys (45.9%) than girls (40.9%).

Occupational status, income, and education are related to dental caries. A study conducted in Ibadan, Nigeria showed that populations with the worst oral health are those with the highest poverty rates and the lowest education [14]. In another study done in Nigeria [15], a higher prevalence of dental caries was recorded among children of high social class (46.9%) compared with those from low social class (12.6%).

Some studies showed an association between family size and dental caries. A study done in Mexico showed that children in large families had a higher prevalence of dental caries than in small families [16].

Prevalence of dental caries and associated factors in Zambia are not well documented. A study done in 1996 reported an increase in caries among the youth and young adults [17]. Therefore, this study aimed to determine the prevalence of caries and associated factors in permanent dentition among primary schoolchildren in Ndola District, Zambia.

Methods

A cross sectional study involving 365 children in primary schools was conducted. A pilot study of 36 children from one urban and one peri-urban area was used to obtain information to calculate the sample size. Consent letters were given to 385 children, and out of this 365 (94.8%) presented a written parental consent to participate. This study had dental caries as the dependent variable while age, sex, and geographical location were independent variables.

Data were collected between January and March 2017 using a structured questionnaire. The questionnaire was administered to children by trained assistants. A convenience sample of three urban and three peri-urban primary schools in Ndola District were selected from the list of 57 primary schools obtained from the District Education Board Secretary's office (DEBS). Children were selected by systematic random sampling.

Permission was obtained from Copperbelt University School of Medicine administration, the DEBS office, and Principals of each school before commencing the research. Ethical approval was obtained from the Tropical Diseases Research Centre (IRB NO. 00002911, FWA NO. 00003729).

Table 1: Distributions of participants by demographic characteristics

	Total	Male	Female	
Demographic variable	n (%)	n (%)	n (%)	p value
Age (years)				
5- 10	251 (100)	125 (49.8)	126 (50.2)	0.458
11-17	114 (100)	52 (45.6)	62 (54.4)	
Geographical location				
Urban	184 (100)	81 (44.0)	103 (56.0)	0.085
Peri- Urban	181 (100)	96 (53.0)	85 (47.0)	

Table 2: Frequency distribution of participants according to caries experience by age

Age (years)	Total	With caries n (%)
5, 6	54	2 (3.7)
7	63	6 (9.5)
8	66	12 (18.2)
9	28	4 (14.3)
10	40	6 (15.0)
11	41	9 (22.0)
12	35	4 (11.4)
13 – 17	38	4 (10.5)

Table 3: Decayed, missing, and filled teeth among 365 children

	Total	(Minimum, maximum)	Mean
Decayed	47	(1, 7)	0.129
Missing	3	(0, 3)	0.008
Filled	0	(0, 0)	0
DMFT*	49	(0, 7)	0.134

*D- Decayed, M- Missing, F- Filling, T-Tooth

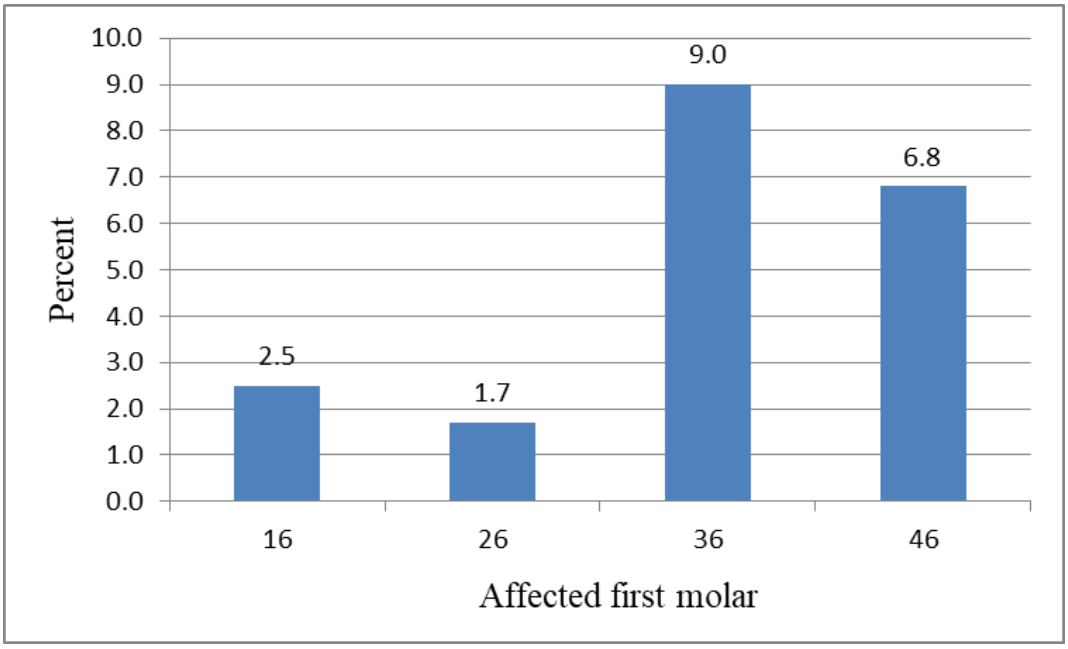
Table 4: Distribution of caries experience according to sex, geographical location, and family size

Variable	Total n (%)	Caries free n (%)	With caries n (%)	p value
Sex				
Male	177 (100)	153 (86.4)	24 (13.6)	0.706
Female	188 (100)	165 (87.8)	23 (12.2)	
School				
Urban	184 (100)	153 (83.2)	31 (16.8)	0.022
Peri-urban	181 (100)	165 (91.2)	16 (8.8)	
Family size				
Up to 5	302 (100)	262 (86.8)	40 (13.2)	0.646
More than 5	63 (100)	56 (88.9)	7 (11.1)	

Table 5: Distributions of dental caries according to family income, mother and father's level of education.

Caries Status				
Demographic Characteristics	**Total n (%)**	**Caries free n (%)**	**With caries n (%)**	**p value**
Family income				
< K 600	153 (100)	137 (89.5)	16 (10.5)	0.014
K 600 +	107 (100)	84 (78.5)	23 (21.5)	
Mother education				
Up to primary	100 (100)	88 (88.0)	12 (12.0)	0.391
Secondary / Tertiary	171 (100)	144 (84.2)	27 (15.8)	
Father education				
Up to primary	55 (100)	51 (92.7)	4 (7.3)	0.097
Secondary / Tertiary	212 (100)	178 (84.0)	34 (16.0)	

Figure 1: Percentage distribution of Dental caries on first molars among participants



The modified WHO criterion (WHO, 1997) for caries diagnosis was used. The clinical examinations were carried out by four examiners in a classroom with wide open widows to provide natural light. Subjects leaned on a pillow placed on the lap of the examiner with the head facing upward and the mouth opened. To prevent transmission of infection, a new or disinfected round-ended probe, examination mirror, pair of examination gloves, and face mask was used for each child. Hand washing was exercised accordingly. The data was recorded on individual questionnaires and children with diagnoses of caries were given notes to take to their parents so that they could take them for treatment to nearby dental clinics.

Data were entered and analyzed using SPSS version 20 to generate frequencies and cross-tabulations. Chi-square test was used to compare differences of the outcome measure (dental caries) and was assumed significant when p value was ≤0.05. Multivariate analysis was done for variables that were significant (family income and geographic location) and associations were assumed when the 95% confidence intervals excluded 1.

Results

A total of 365 children aged 5 to 17 years were enrolled in this study, out of these 177 (48.5%) were males. Distributions of participants according to age and geographical location of the school by sex were statistically non-significant as shown in Table 1. Less than half 177 (48.5%) reported brushing their teeth for 2 or more minutes daily and only 71 (19.5%) had been for dental check-up.

Table 2 shows frequency distribution of participants according to caries experience by age. Altogether, 47(12.9%) of the participants had caries .The most affected age group was 11 years old; 22.0% of them had caries.

Mean decayed, missing, and filled teeth (DMFT) components are presented in Table 3. No subject had a tooth with a filled cavity.

Table 4 shows distributions of caries experience by sex, geographical location, and family size. School geographical location was significantly (p=0.022) associated with dental caries, as 31 of the 184 (16.8%) children living in urban areas were affected compared with 16 of 181 (8.8%) of those from peri-urban schools.

The lower left first molar (9.0%) was the most frequently affected tooth by caries, followed by the lower right first molar (6.8%); Table 5 shows distributions of dental caries according to family income, mother's education, and father's education. Family income was significantly (p= 0.014) associated with caries experience with more children from families with a monthly income of >K 600 were found with caries than those from low income families (21.5% versus 10.5%).

Geographical location and family income were included in logistic regression model. Geographical location (OR = 1.22, 95% CI = 0.85-1.75) was not independently associated with dental caries but family income was significantly associated with dental caries (OR = 0.65, 95% CI = 0.46 - 0.92). Children from families with an income of <K 600 were 35% less likely to have dental caries compared with children from families with income of K 600 or more.

Discussion

The overall prevalence of dental caries in the current study was 12.9%, 13.6% in boys, and 12.2% in girls. Geographical location was statistically associated with dental caries, as children living in urban areas were more affected than those in peri-urban areas (16.8% compared with 8.8%). These results are consistent with a study done in Burkina Faso that revealed a higher prevalence in urban (46%) than rural (32%) areas [18]. Similarly, a study in Zimbabwe [19] showed more caries in urban schoolchildren (59.5%) than in rural schoolchildren (40.8%). The results also showed a mean DMFT of 1.29 for urban schoolchildren and 0.66 for rural schoolchildren. The higher prevalence of caries in Ndola urban areas could be due to inadequate oral hygiene combined with easy access to cariogenic foods and sugary drinks [17].

The current study found a positive relationship between higher family income and more dental caries. This finding correlates with a study done in Nigeria [15] where the prevalence of caries was higher among children of high (46.9%) than low (12.6%) social class. In contrast, in the United States, children from high income families had a lower caries experience (16.3%) compared with those in lower income groups (24.1%) [20].

The current study did not reveal a significant association between family size and dental caries. The findings are contrary to a study done in Mexico which revealed a significant association between family size and dental caries [16] on permanent dentition. In a study done in Argentina, low parental level of education was associated with the high level of caries experience [21]. However, the current study showed no statistically significant association between mother's level of education or father's level of education and dental caries.

The occurrence of dental caries showed the lower left first molar (9.0%) to be the most often affected tooth, followed by the lower right first molar (6.8%). These findings could be attributed to the early eruption of these teeth [22]. These results agree with the results of a study in South Africa [23] that found that the lower molar teeth experienced a higher incidence of caries than upper molars. In contrast, in a study done in Nigeria, a higher incidence of dental caries was found in second molars compared with first molars [24].

The highest mean DMFT in this study was found in children aged 11 years; 22.0% of them had missing or decayed teeth, while the F component was zero.

One of the limitations of the study was that the sample was not randomly selected. Furthermore, the participants were those

that were present at school during data collection. Those absent could have been different from those present and the results may not be generalizable to the rest of the children who did not take part in the study.

Conclusions and Recommendations

Dental caries prevalence among primary schoolchildren in Ndola district was low. However, dental caries prevalence was higher in urban and high-income families than in rural and low income families. It was also noted that there were few participants that had dental check-ups, and among these, none had fillings. Regular dental check-ups should be conducted more in urban schools and fissure sealants applied to children at high caries risk.

Competing Interests

The authors declare that they have no competing interests.

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