

Prevalence and factors associated with dental caries among rural school children aged 13-16 year old in Edo state, Nigeria

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ABSTRACT

BACKGROUND

Dental caries can affect children in rural areas and the prevalence of dental caries can vary from one location to another.

OBJECTIVE

To determine the prevalence and factors associated with dental caries among school children aged 13-16 year old in Uhumwonde Local Government Area in Edo State, South-south Nigeria.

METHODS

A cross sectional descriptive study was conducted among 13-16 year old school children in rural communities in Uhumwonde Local Government Area in Edo State . Socio-demographic data was obtained using questionnaire. Oral examination for the presence of dental caries was conducted using the DMFT index. Tests of association between dependent variable (dental caries) and independent variables were conducted using Chi square/fisher exact test. Risk indicators for dental caries was determined using multivariate logistic regression analysis. Crude odd ratio (COR) and adjusted odd ratio (AOR) was assessed. Statistical analysis was done using SPSS Version 28. P<0.05 was considered statistically significant.

RESULTS

A total of 200 school children participated in the study and 104 (52.0%) were females. The prevalence of dental caries was 5.5% with mean DMFT of 0.08± 0.35. Dental caries occurrence was higher among 13 year old and females. There was statistically significant association between frequency of tooth-brushing (P= 0.003), oral hygiene status (P= 0.002) and dental caries occurrence. Oral hygiene status was a risk indicator for dental caries in the study population. (P= 0.016)

CONCLUSION

The prevalence of dental caries in the study population was low. Oral hygiene status was a risk indicator for dental caries.

KEYWORDS

Caries , Community, Locality, Public, Oral health.

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INTRODUCTION

Dental caries is a multifactorial,¹ biofilm mediated demineralisation of dental hard tissues, through organic acid produced from cariogenic bacteria metabolism of fermentable carbohydrate.² The appearance of a chalky white spot on the surface of the tooth, indicating an area of demineralisation of enamel is an early sign for dental caries.³ The aetiology of dental caries involves combination of refined sugar, bacteria plaque, susceptible tooth and the time of exposure. Some factors associated with dental caries include tooth brushing technique and frequency, elevated levels of *Streptococcus mutans* in plaque, use of fluoride containing toothpaste, enamel defects, oral health seeking behaviour, access to dental care, snacking/dietary habits and oral hygiene status.³

Dental caries and complications of untreated dental caries can result in high direct and indirect costs to individuals, families and governments especially in low resource economies.² It can also restrict¹ play and school activities among children.⁴ The prevalence of dental caries among 12-14 year old children in Qatar was 85.0%,² in India, it was 62.4% among 11-16 year old school children,³ and 54.4% among 12-15 year old school children in Palestine.⁵ In Nigeria, the prevalence of dental caries was 16.0%¹ among 12-15 year old children in Ibadan, Oyo state, south west Nigeria, another study in Nigeria reported a prevalence of 7.7 %⁴ among 12-15 year old school children in Esan central local government area in Edo state, Nigeria. Rural community based studies on dental caries among children in underserved areas can provide information for planning oral health intervention programmes for children with high dental caries experience, high level of untreated dental caries and poor access to oral health care. The aim of this study is to determine the prevalence and factors associated with dental caries among 13-16 year old school children attending public schools in rural communities in Uhumwonde Local Government Area in Edo State, South-south Nigeria.

METHODS

A cross-sectional descriptive study was conducted in Uhumwonde Local Government Area in Edo State, South-south Nigeria. Edo state has eighteen Local Government Areas (LGAs). Uhumwonde Local Government Area has urban and rural areas. Ethical clearance for this study was sought and obtained from Health Research Ethics committee, Edo State Ministry of Health. Permission was sought and obtained from State Secondary Education Board, Edo State. Informed consent was obtained from the parents of the school children and assent was obtained

from the school children. School children aged 13-16 year old attending public schools in Uhumwonde Local Government Area participated in this study and the study participants were randomly (simple random sampling) selected by picking of labelled ballot papers using pre-defined inclusion and exclusion criteria.

Sample size was calculated using

$$N = \frac{Z^2pq}{d^2}$$

d^2

N = sample size

p = prevalence

$q = 1.0 - p$

Prevalence of dental caries was 12.2%⁷ from a previous study in Ogun state, Nigeria

$Z = 1.96$

$p = 12.2\% (0.122)$

$q = 1 - 0.122 = 0.878$

$d = 0.05$

$$n = \frac{(1.96)^2(0.122)(0.878)}{(0.05)^2} = 164.6 \text{ approximately } 165$$

10% of non-responders = 17

$165 + 17 = 182$; However, two hundred children were selected for this study

Data collection was done in the year 2025. Socio-demographic data (age, sex, frequency of tooth brushing, use of fluoride containing toothpaste) were obtained using questionnaire. Oral examination for the presence of dental caries was conducted using the DMFT index⁸ Oral hygiene status was assessed using simplified oral hygiene index⁸ as used in a previous study.⁷

The students were examined while seated in a classroom chair using natural daylight and sterile oral examination tool. A recording clerk was used for recording oral examination findings. Standard precautions and confidentiality was ensured during data collection. Data were entered into SPSS and statistical analysis was done using Statistical Package for Social Sciences (SPSS) Version 28. Descriptive analysis was conducted to determine the prevalence of dental caries among public-school children in the rural communities. Tests of association between dependent variable (presence of dental caries) and the independent variables (age, sex, frequency of toothbrushing, oral hygiene status and use of fluoride containing toothpaste) were conducted using Chi square/fisher exact test. P values < 0.05 were considered statistically significant. Frequency distribution, percentage, mean and standard deviation were calculated. Risk indicator for dental caries among

children attending rural public school was determined using multivariate logistic regression analysis. Inferential analysis to determine the predictor of dental caries was done using logistic regression analysis (binary logistic regression analysis). Independent variables with P value < 0.05 during the bivariate analysis were entered into multivariable analysis (binary logistic regression analysis). Crude odd ratio (COR) and adjusted odd ratio (AOR) were assessed to identify the risk indicator for dental caries. The independent variables of the regression model were frequency of tooth-brushing and oral hygiene status.

RESULTS

A total of 200 school children participated in the study and 104 (52.0%) were females. The age range of the school children was 13 to 16 year old with a mean age of 14.84 ± 1.00 . Table 2 shows the prevalence of dental caries was 5.5% with mean DMFT of 0.08 ± 0.35 . Dental caries occurrence was higher among 13 year old and females. Dental caries was higher in mandibular teeth and lower left first permanent molar. All the carious teeth seen were untreated and restorative index was 0.0%. Table 3 shows there was no statistically significant association between sex ($P = 0.541$), age ($P = 0.429$), use of fluoride containing toothpaste ($P = 0.625$) and dental caries experience. There was statistically significant association between frequency of tooth-brushing ($P = 0.003$), oral hygiene status ($P = 0.002$) and dental caries occurrence. Oral hygiene status was a risk indicator for dental caries in the study population COR (95% CI) 0.113(0.027-0.477), AOR: 0.151, 95% CI: 0.032-0.707, $P = 0.016$ CI: Confidence interval, COR :Crude Odd Ratio, AOR: Adjusted Odd Ratio

Table 1: Profile of the study participants N=200.

Variables	Frequency n(%)
Age(year)	
13	22(11.0)
14	53(26.5)
15	60(30.0)
16	65(32.5)
Sex	
Male	96(48.0)
Female	104(52.0)
Oral hygiene status	
Good	62(31.0)
Fair	125(62.5)
Poor	13(6.5)

Frequency of tooth brushing	
Once daily	198(99.0)
Twice(occasionally)	2(1.0)
Use of fluoride containing toothpaste	
Yes	176(88.0)
No	24(12.0)
Total	200(100.0)

Table 2: Prevalence of dental caries among the study participants N=200.

Variable	Caries present n (%)	Caries absent n (%)	Total n (%)
Age(years)			
13	2(9.1)	20(90.1)	22(100.0)
14	1(1.9)	52(98.1)	53(100.0)
15	3(5.0)	57(95.0)	60(100.0)
16	5(7.7)	60(92.3)	65(100.0)
Gender			
Male	4(4.2)	92(95.8)	96(100.0)
Female	7(6.7)	97(93.3)	104(100.0)
Total	11(5.5)	189(94.5)	200(100.0)

Table 3: Association between age, sex, frequency of toothbrushing, oral hygiene status, use of fluoride containing toothpaste and dental caries among the study participants N=200

Variable	P-value
Age (years)	0.429*
Gender	0.541"
Frequency of tooth brushing	0.003*
Use of fluoride containing toothpaste	0.625*
Oral hygiene status	0.002*

*: Fisher's exact test ": chi-square test

DISCUSSION

The prevalence of dental caries can vary from one location to another³ as a result of variation in predisposing and associated factors^{3,9-10} for dental caries. Dental caries is a significant public health^{2,9} problem especially in countries with low income, high prevalence of dental caries and impacts on the economy in terms of direct and indirect cost² on the individual, families and community.⁴ This study provides information on the prevalence and factors associated with dental caries in a representative

sample of 13 to 16 year old school children in selected rural communities in Uhumwonde Local Government Area in Edo State, South-south Nigeria. In this study, the prevalence of dental caries was close to previous study of 7.7% among 12 -15 year old in Esan Central Local Government Area,⁴ this finding could be as a result of the use of fluoride containing toothpaste and frequency of intake of cariogenic diet and sugar containing drinks among the study participants. The finding in this study was less than 12.2%⁷ among children in rural communities in Ogun state, south west Nigeria, this finding could be as a result of differences in cultural and dietary practices, socio-economic status and location of the study participants. The prevalence of dental caries in this study was also lower than previous reports of 8.4% among adolescents in south-east Nigeria¹¹, 16.0%¹ among adolescents in south-west Nigeria, 53.4% among school children in Palestine,⁵ 57.5% among school children in Bangladesh¹⁰ and 85.0% among school children in Qatar.² This variation in study findings could be as a result of differences in socio-cultural and dietary practices⁹ and variations in economies. The mean DMFT in this study was low as previous report in Esan Central Local Government Area⁴. Dental caries was more in mandibular teeth, in agreement with previous study^{7,11} and different from another study². This finding in this study could be as a result of gravity. Dental caries was higher in females in this study, consistent with previous studies^{1-2,10-11} and different from another study.³ This finding could be because females consume more cariogenic diet than males in the study population.

In this study, there was no statistically significant association between sex, age, use of fluoride containing toothpaste and dental caries experience, and it was consistent with report of previous study.^{4,11} The association between frequency of tooth-brushing frequency, oral hygiene status and dental caries experience was statistically significant in this study, this finding was different from report of previous studies.^{2,4,11} Oral hygiene status was a risk indicator for dental caries in this study. Twice daily toothbrushing with fluoride containing toothpaste can be effective in reducing bacteria plaque accumulation and removal of fermentable carbohydrate/substrate² on the teeth, which cariogenic bacteria act on to produce organic acids. Poor and fair oral hygiene status have plaque, food debris and or calculus deposits on the teeth that can enhance dental caries formation through demineralisation of tooth structure. The maintenance of good oral hygiene can help to reduce bacteria plaque accumulation,² calculus deposits on the teeth, fermentable carbohydrate/substrate accumulation and organic acids production by cariogenic bacteria. The limitations of this study are the associated factors of dental caries among the school children could be evaluated in a longitudinal study, radiographs (bitewing radiographs) were not be used to detect interproximal caries in this study and the study was a public school based study, the findings of this study might not represent children attending private schools and out of school children or adolescents not attending any school.

CONCLUSION

The prevalence of dental caries was 5.5%. Oral hygiene status and frequency of tooth-brushing was significantly associated with dental caries. Oral hygiene status was a risk indicator for dental caries. Oral health education with tooth brushing demonstration and interventions for untreated carious teeth are recommended.

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