

Prevalence of Dental Fluorosis among Secondary School Children in Oloibiri Community

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Authors' contributions

This work was carried out in collaboration between all authors. Authors BCEE and EF designed the study, wrote the protocol, managed the literature searches and wrote the first draft of the manuscript. Author BCEE performed the statistical analysis while authors AAA and OR did the analyses of the study. All authors read and approved the final manuscript.

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ABSTRACT

Background: Dental fluorosis with its attendant complication of aesthetic distortion of the teeth has now become another focus of public health intervention worldwide. We studied the prevalence of dental fluorosis among school children at Oloibiri, Ogbia Local Government Area of Bayelsa state, Nigeria.

Methods: A cross-sectional survey of school children attending the Government Secondary School, Oloibiri within the age group of 11-19 years (JSS 1 – SS 3) was performed in January 2015. Each subject was seated on a chair in bright daylight and the teeth were not dried prior to the examination for fluorosis. The presence of dental fluorosis and its severity were recorded and the Dean's index was used to determine the grade of dental fluorosis. The prevalence and community fluorosis index were calculated.

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Results: The mouth prevalence of dental fluorosis among our study sample was 18% and the Community Fluorosis Index was 0.42. The predominant type of dental fluorosis detected was the very mild variant of the condition (n=12). All subjects examined in this study presented with a low dental caries status.

Conclusion: Dental fluorosis and dental caries are not public health problems in Oloibiri Community. Health awareness and education about the use of fluoride are recommended in order to effectively drive home the public health desire of achieving optimal dental health for all round the globe.

Keywords: Dental fluorosis; prevalence; secondary school children.

1. INTRODUCTION

Oral health, an inseparable component of an individual's general health has in recent times being advocated in all ramifications in order to ensure the maximum preservation of one's self-esteem as well as general wellbeing of an individual. As a result of certain factors ranging from oral health misconceptions to negligent oral health attitudes, various diseases afflict the oral cavity, thus affecting the achievement of optimal oral health. The occurrence of these diseases brings upon the individuals affected as well as health care providers a burden which requires a multi-axial management approach in order to restore optimal oral health [1-3]. Prevalent among these diseases is dental fluorosis which in literary terms, took over from dental caries as a major disease of public health concern affecting the oral cavity [4]. "Taking over" in the sense that prior to this period, dental caries was a major disease affecting the oral cavity until public health interventions of water fluoridation and introduction of various fluoride supplements which on one hand tackled the menace of dental caries by making the hard tooth structure resistant to the demineralizing actions of acids produced in the mouth by the activities of cariogenic bacteria but on the other hand led to the arrival of a new disease of public health concern known as dental fluorosis [5,6].

Dental fluorosis, an aesthetic condition; arises as a result problems occurring during tooth development. It involves the incorporation of excessive amounts of fluoride in the enamel of the tooth as it develops. This inadvertently leads to the destruction of ameloblasts and the formation of abnormal looking pitted enamel surface [7,8]. This appearance is however dependent on the severity as well the timing of exposure to excessive fluoride levels [9]. Dental fluorosis with its attendant complication of aesthetic distortion of the teeth has now become another focus of public health intervention

worldwide. Continuous monitoring of global occurrences of fluorosis as well as health education on the appropriate use of fluoride should however be constantly advocated to ensure that this disease is tackled squarely [10-12].

The presence of this disease has been reported in the past at Ogbia main town located within the Ogbia Local Government Area of Bayelsa State [13]. In a bid to boost research data regarding the occurrence of this disease in Bayelsa State and the need to establish unconfirmed reports of dental fluorosis being a public health problem in Oloibiri Community also located within the Ogbia Local Government Area of Bayelsa State, it was thus necessary to carry out this research work.

2. MATERIALS AND METHODS

A cross-sectional survey of school children attending the Government Secondary School, Oloibiri within the age group of 11-19 years (JSS 1 – SS 3) was performed in January 2015. This age group of children was selected because they represent a population at risk of developing dental fluorosis as a result of the vulnerability of tooth calcification being overtaken by deposition of excessive fluoride [14].

A purposive sampling technique was employed in which all the students whom attended school on the day of data collection were examined. Approval to conduct the study was obtained from the school authorities. Oral examination of the students was carried out by health care professionals trained in identifying enamel lesions caused by dental fluorosis. Each subject was seated on a chair in bright daylight and the teeth were not dried prior to the examination for fluorosis.

The presence of dental fluorosis and its severity were recorded and the Dean's index [15] was used to determine the grade of dental fluorosis as thus:

- *Unaffected*: The enamel is translucent. The surface of the tooth is smooth, glossy, and usually has a pale creamy white colour.
- *Questionable*: The enamel shows slight changes ranging from a few white flecks to occasional white spots. This classification is utilized in those instances in which a definitive determination of the mildest form of fluorosis is not warranted and a classification of unaffected is not justified.
- *Very mild*: Small opaque paper-white areas are scattered over the tooth surface, but do not involve as much as 25% of the surface.
- *Mild*: White opaque areas on the surface are more extensive, but do not involve as much as 50% of the surface.
- *Moderate*: White opaque areas affecting more than 50% of the enamel surface.
- *Severe*: All enamel surfaces are affected. The major aspect of this classification is the presence of discrete or confluent pitting of the enamel surface.

The prevalence of dental fluorosis was estimated by summing all occurrences of dental fluorosis which showed definite signs of the condition. This implied adding up the occurrences from very mild fluorosis to severe fluorosis. Community Fluorosis Index (CFI) was derived by multiplying the numerical weight (statistic consideration: p) and the frequency of fluorosis and dividing the result by the total sample. A community fluorosis index of greater than 0.6 implies that in a particular area studied, dental fluorosis was a public health problem [16].

3. RESULTS

3.1 Demographic Data

Altogether, 99 subjects were involved in this study. The modal age was 14, n=24 (24.2%); 55.6% of the respondents were male and 44.4% of the respondents were female; the demographic data of the respondents is shown in Table 1.

3.2 Mouth Prevalence of Dental Fluorosis

After oral examination of the 99 subjects involved in this study, 58 (59%) of the subjects were not affected by dental fluorosis, 23 (23%) of them had questionable fluorosis, 12 (12%) of the subjects had very mild fluorosis, 3 (3%) of them had mild fluorosis, 0 (0%) had moderate fluorosis and 3 (3%) of the subjects had severe fluorosis. This is shown in Fig. 1.

3.3 Prevalence of Dental Fluorosis

The Dean's Index was used in calculating the prevalence of dental fluorosis with the prevalence of dental fluorosis considering only cases with definite signs of fluorosis ranging from very mild fluorosis to severe fluorosis. The attainment of the Community Fluorosis Index was based on Dean's (1942) Index score (0 – 4.0) for dental fluorosis. This is shown in Table 2.

Table 1. Demographic data of subjects

Variable	Frequency	Percentage (%)
Age		
11	4	4.0
12	10	10.1
13	17	17.2
14	24	24.2
15	16	16.2
16	15	15.2
17	10	10.1
18	2	2.0
19	1	1.0
Gender		
Male	55	55.6
Female	44	44.4

N= 97

Age range: 11 – 19 Years; Modal Age: 14 (n = 24, 24.2%)

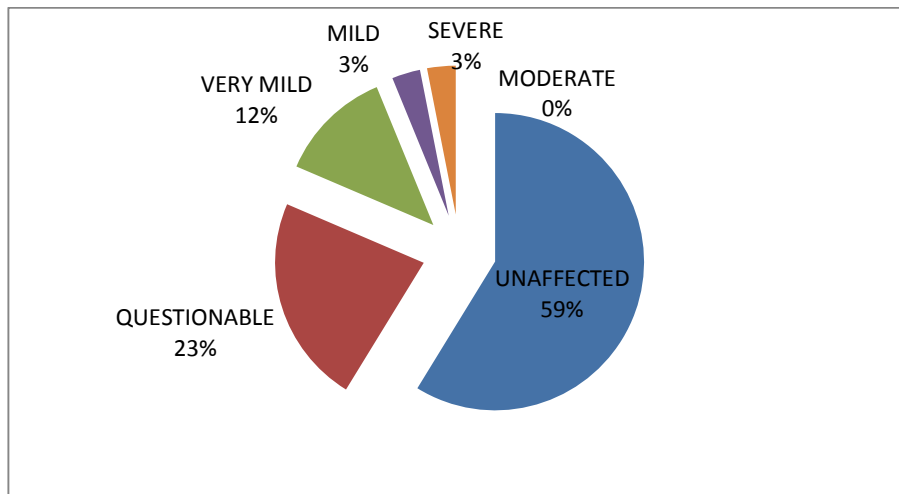


Fig. 1. Mouth Prevalence of dental fluorosis among students aged between 11-19 years attending Government secondary school, Oloibiri

Table 2. Dean’s index to determine prevalence of dental fluorosis and community fluorosis index in students of Government secondary school, Ogbia

	Frequency of fluorosis	Percentage (%)	Weight of fluorosis	Frequency* weight of fluorosis
Unaffected	58	59	0	0
Questionable	23	23	0.5	11.5
Very mild	12	12	1	12
Mild	3	3	2	6
Moderate	0	0	3	0
Severe	3	3	4	12
Total	99	100		41.5

**Note: The prevalence of dental fluorosis considers only cases with definite signs of fluorosis ranging from very mild fluorosis to severe fluorosis (Dean, 1942).*

From table above:

Prevalence of Fluorosis = Summation (Frequencies of Very Mild, Mild, Moderate and Severe Fluorosis)

$$= 12 + 3 + 0 + 3$$

$$= 18 (18\%)$$

Community fluorosis index

This is equal to:

$$= \frac{\text{Summation (frequency of fluorosis * weight of fluorosis)}}{\text{Total sample}}$$

$$= \frac{41.5}{99}$$

$$= 0.42 \text{ (Borderline for public health significance)}$$

3.4 Relationship between the Dental Fluorosis Status and Dental Caries Status of the Students

All subjects examined in this study presented with a low dental caries status despite also presenting with varying levels of dental fluorosis. Majority of the subjects (82%) however presented with teeth not affected by dental fluorosis or had questionable forms of dental fluorosis as previously shown in Table 2 above. The dental caries status of the subjects involved in this study is shown in Table 3.

Table 3. Dental caries status (Using the decayed, missing, filled teeth index)

Dental caries status	0 – 4 (Low)	5 - 9 (Medium)	> 9 (High)
Male	55 (55.6%)	0 (0.0%)	0 (0.0%)
Female	44 (44.4%)	0 (0.0%)	0 (0.0%)
Total	99 (100.0%)	0 (0.0%)	0 (0.0%)

4. DISCUSSION

Amidst the varying occurrences of cases of dental fluorosis all around the globe, the efficacy of fluoride as an element vital in the prevention of dental caries cannot be over-emphasized. The significant dental health benefits have continued to be identified in different populations, which have over time led to the weighing of its benefits against the relative increase in the occurrence of dental fluorosis [9,13,17]. Water fluoridation however, remains a public health approach by which this vital element is delivered across various populations of the world [18]. In our study involving the assessment of the prevalence of dental fluorosis in Oloibiri Community located in Ogbia Local Government Area of Bayelsa State, dental fluorosis showed a low level prevalence of 18% as well as presented with a community fluorosis index which was border-line for public health significance. This result is corroborated by previous findings of authors in Nigeria and overseas, who recorded low prevalence rates of dental fluorosis among populations that were assessed [7,13]. This is however not the case with Gopalakrishnan et al. [14] who recorded a dental fluorosis prevalence of 35.6% as well as reports in Brazil and Pakistan, in which dental fluorosis prevalence of 80.4% and 85% were reported respectively [8,19]. These were indicative of high levels of dental fluorosis occurrence in these study areas which have been attributed to high fluoride concentrations in groundwater supplies as well as fluoride ingested in foods and beverages, domestic salt, toothpastes (during toothbrushing) etc [20,21]. The low prevalence of dental fluorosis in our study area can however be attributable to a reduction in the amounts of fluoride readily available to the children in our study area. This could have been achieved via reduced frequency of toothbrushing, use of pea-sized amount of fluoride toothpaste for toothbrushing as well as ensuring that the children spit out the dentifrice after toothbrushing [17,18,22,23]. Comparison of the percentage of severe cases of dental fluorosis in our study population with that gotten in a previous study conducted in the same Local Government Area as our study area is worthy of note as our study presented with 3% of severe

cases of dental fluorosis as against 7% of cases reported at the Government Secondary School, Ogbia, Bayelsa State. This further reiterates suggestions that children residing in Oloibiri Community are exposed to reduced levels of fluoride and thus having reduced levels of the occurrence of dental fluorosis unlike their counterparts residing at Ogbia main town in Ogbia Local Government Area of Bayelsa State [13]. Majority n=12 (66.7%) of the students however presented with very mild forms of fluorosis. This is similar to the findings of other studies in which majority of students examined presented with very mild or mild variants of the fluorotic disease [7,10].

It is not surprising to have a low dental caries status among the subjects involved in this study. This can mainly be attributed to the cariostatic property of fluoride which reduces the caries risk of individuals whom are exposed to adequate quantities of fluoride [4,17]. The widespread use of fluoride is also contributory to this low caries status. It should however be noted that with the occurrence of more severe forms of fluorosis, caries risk is increased as a result of enamel loss and subsequent enamel pitting [14,19,24,25]. The public health significance of fluorides is remarkable especially in the prevention of dental caries which had at some point in time being a public health menace affecting the oral cavity [17,19]. The introduction of water fluoridation strategies globally however solved this problem but led to the occurrence of a new public health concern known as dental fluorosis which was further compounded with the presence of naturally occurring sources of fluoride in water, foods as well as the soil and the use of fluorides in dentifrices as well as fluoride supplements [8,11]. Presently, the practice of fluorosis preventive strategies have become the bane in ensuring that dental fluorosis becomes an insignificant public health issue [4,6]. These strategies in no particular order include using pea-sized dentifrices on toothbrushes for toothbrushing, spitting out the dentifrice after toothbrushing, development of low-fluoride dentifrice for children less than six years of age, ensuring that only required levels of fluoride are made available in public water fluoridation,

specification of fluoride concentration of packaged drinking water for consumer awareness, education of health professionals as well as the general public on the safe use practices of fluoride [9,18]. At this point, it is certainly safe to say that "increased awareness and education about fluoride use and not increased fluoride use is a better course of action".

5. CONCLUSION

Dental fluorosis and dental caries are not public health problems in Oloibiri Community, however based on the public health significance of the use of fluoride in ensuring dental health, health awareness and education about the use of fluoride are recommended as vital agents needed to drive home the public health desire of achieving optimal dental health for all round the globe.

CONSENT

All authors declare that informed consent was obtained from all subjects prior to oral examination.

ETHICAL APPROVAL

Ethical approvals for this study were obtained from the Research and Manpower Unit of the Bayelsa State College of health Technology Otuogidi, Ogbia, Bayelsa State as well as from the management authorities of the Government Secondary School, Oloibiri, Ogbia, Bayelsa State.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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