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Prevalence of Dental Fluorosis in ECWA Nursery and Primary School, Kaltungo L.G.A. Gombe State, Nigeria

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ABSTRACT: The study was carried out between May and October 2017 to find out the prevalence of dental fluorosis among pupils attending Nursery and Primary School, Kaltungo Local Government Area, Gombe State, Nigeria using Deans Index [**DI**]. Among the specific objectives to identify the prevalence and severity of dental fluorosis through the oral examination of their mouth. A total number of 150(**100.00%**) participants, comprising of 81(**54.00%**) males and 69(**46.00%**) females was selected through stratified sampling techniques. Their mouth was observed, and findings was recorded on a data sheet. 114(**76.00%**) of the respondents have dental fluorosis, of which 27(**18.00%**) was questionable, 15(**10.00%**) was very mild, 29(**19.33%**) was mild, 21(**14.00%**) was moderate, 22(**14.67%**) was severe and only 36(**24.00%**) had normal set of teeth without dental fluorosis. The result of hypothesis shows a value of 76. This simply mean that dental fluorosis is prevalent among the pupils of **ECWA** Nursery and Primary School in Kaltungo Local Government Area of Gombe State, Nigeria. Therefore, reduction of fluoride level in drinking water should be done by the water cooperation to check the fluoride concentration of tap, well and borehole water at regular intervals, and use of extra fluoride supplement should be discouraged unless recommended by a dental professionals.

Key Words: Defluoridation, Fluoridation, Fluoride, Fluorine, Fluorosis, Fluoroapatite, P.P.M, Prevalence.

I. INTRODUCTION

Oral health is essential to general, health and quality of life. It is a state of being free from mouth and facial pain, oral and throat cancer, oral infection, and sores, periodontal (gum) diseases, tooth decay tooth loss and other diseases and disorder that limit an individual's capacity in biting, chewing, smelling, specking and psychosocial wellbeing[1].Dental fluorosis also called mottling of tooth enamel is a developmental disturbance of dental enamel caused by excessive exposure to high concentrations of fluoride during tooth development[2].

[3]explains that dental fluorosis is a set of defects of enamel and dentine as a result of excessive ingestion of fluoride during the critical period of tooth formation. According to[2]dental fluorosis is a common disorder, characterized by hypomineralization of tooth enamel caused by ingestion of excessive fluoride during enamel formation It appears as a range of visual changes in enamel [4]causing degrees of intrinsic tooth discolouration, and, in some cases, physical damage to the teeth. The severity of the condition is dependent on the dose, duration, and age of the individual during the exposure[5].

Dental fluorosis is a chronic fluoride–induced condition in which an excess of fluoride is incorporated in the developing tooth enamel and disrupt the enamel formation of the tooth. Prevalence of dental fluorosis due to high levels of fluoride in drinking water is an endemic global problem. Although, definite mechanism of dental fluorosis is yet to be confirmed, hypomineralization of teeth enamel is the real fact and so the teeth enamel become more porous and softer than the normal counterparts. More exposure to the fluoride, greater is the rate of dental fluorosis. Also, children with mild dental fluorosis had lower IQ than those without dental fluorosis demands further investigation.

The risk of fluoride over exposure occurs between the age of 3 months to 8 years[6].Fluorosis often appears an unnoticeable, tiny white streaks specks in the enamel of the tooth in its most severe form, tooth appearance is marred by discoloration or brown marking. The enamel may pitted, rough and hard to clean, the spot and stains left by fluorosis are permanent and may darken over time[7]. The increase in dental fluorosis has been attributed to the consumption of fluoride from sources other than community water supplies, such sources are infant formula, fluoride supplement and fluoridated toothpaste, since all of this have been observed to be the risk factors of dental fluorosis,

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efforts should be made to reduce children's exposure to excess fluoride during the years of enamelformation[8].

Teeth affected by fluorosis vary with regard to severity of enamel changes seen which includes hypo calcification and hypoplasia. The crown of the teeth may appear chalky and opaque. All teeth exposed to excess fluoride during development are involved[9].The very mild (and most common) form of fluorosis, is characterized by small, opaque, "paper white" areas scattered irregularly over the tooth, covering less than 25% of the tooth surface. In the "mild" form of the disease, these mottled patches can involve up to half of the surface area of the teeth. When fluorosis is moderate, all of the surfaces of the teeth are mottled, and teeth may be ground down and brown stains frequently "disfigure" the teeth. Severe fluorosis is characterized by brown discoloration and discrete or confluent pitting; brown stains are widespread, and teeth often present a corroded-looking appearance[5].People with fluorosis are relatively resistant to dental caries (tooth decay caused by bacteria), although there may be cosmetic concern, in moderate to severe fluorosis, teeth are weakened and suffer permanent physical damage[10].[9]explains that Fluoride is ubiquitous (appearing or found everywhere) in the environment, therefore, sources of drinking-water are likely to contain at least some small amount of fluoride. The amount of fluoride present naturally in non-fluoridated drinking water (i.e. drinking water to which fluoride has not been intentionally added for the prevention of dental caries) is highly variable, being depended upon the individual geological environment from which the water is obtained[11].

According to[12]the levels of fluoride may range up to approximately 7.0mg/litre, however, in areas of the world in which endemic fluorosis of fluoride in drinking water occurs, the supplies ranges from 3 to more than 20mg/litre. In areas in which drinking is fluoridated (i.e. fluoride is intentionally added for the prevention of dental caries), the concentration of fluoride in drinking water generally ranges from 0.7 to 1.2mg/litre. The question that needed to be answered is how much fluoride are humans exposed to?[13]explains that although individual exposure to fluoride is likely to be highly variable, the inhalation of air borne fluoride generally makes a minor contribution to the total intake of this substance. For adults, the consumptions of foodstuffs and drinking water is the principal route for the intake of fluoride. In areas of the world in which coal rich in fluoride is used for heating and food preparation, the inhalation of indoor air and consumption of foodstuffs countermining increased levels of fluoride also contribute to elevated. Infants food formula receive 50-100 times more fluoride than exclusively breast food infants[14].

[15]opined that the ingestion of dentrifice by young children makes a significant contribution of their total intake of fluoride. In general, estimated intake of fluoride in children and adolescents do not exceed approximately 2mg/day. Although adults may have a higher absolute daily intake of fluoride in milligrams, the daily intake of fluoride by children, expressed on a milligram per kilograms body weight basis, may exceed that of adults. In certain areas worldwide in which the concentration of fluoride in the surrounding environment may be accordingly high and for where diets are composed of foodstuffs rich in fluoride, estimated intakes of fluoride in adult as high as 27mg/day have been reported, the principal source being drinking water obtained from water sources located in geological areas rich in fluoride[16].Sources of drinking water ($P<0.05$) those who draw from wells appeared more likely to have fluorosis, it was concluded that through other sources of fluoride ingestion have been documented. It appeared that water may play a very significant role in the etiology of fluorosis in this community[1].

II. METHODOLOGY

The research was a cross sectional survey of the pupils attending ECWA Nursery and primary school Kaltungo, Gombe State, Nigeria.The area of the studyis one of the private schools in Kaltungo Local Government Area of Gombe State, Nigeria. It is located in the southern part of the local government at Lapandintai (known as Kasarwaje) and about 7kilometers away from Kaltungo town of Gombe State. The school was established in the year 1985 by ECWA church Sabonlayi board Dr. Hassan Jimeta, Hon. Kiloyobas Audu, Rev. Philip Wakili. The school is about 20.8square kilometer south west of Kaltungo along the local government secretariat. The study area has the total population of 150 pupils. The teaching staffs are 10 whereas non-teaching staff are 5 in number. Stratified sampling technique was used in dividing the class into strata, and 25 pupils were randomly selected from each of the stratum. Thus, a sample size of 150 pupils was selected for the research work.

An introductory letter was collected from the head of Dental Therapy department in Federal College of Dental Technology and Therapy, Trans-Ekulu, Enugu Sate, Nigeria and was given to the

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head of the selected school, to get permission and cooperation of members in the school and to gain an access to their pupils for the purpose of the study. The researcher explained to them on the research that was to be carried on them. All the study participants were interviewed to obtain their demographic data. Intra oral examination was carried out to identify dental fluorosis amongst the pupils in the school. The use of mouth mirror was employed in order to determine the level of dental fluorosis. Special designed data sheet was used to record all the observation and interview made that very day.

The datacollected through oral examination, using basic examination instruments and personal interview was analyzed using simple frequency tables and calculation of percentage was as well used. The result was presented in tables and explained in an essay form for clear understanding. The hypothesis was tested using the prevalence rate test, which is mathematically represented as,

$$\text{Prevalence Rate} = \frac{\text{Total number of occurrence at a specified time}}{\text{Total population}} \times \frac{100}{1}$$

III. RESULTS

Table 1: Gender of the Study Respondents

Gender	Frequency (f)	Percentage (%)
Male	81	54
Female	69	46
Total	**150**	**100**

Source: Field Survey, 2017

Table **1** above indicates that the total number of 150(**100.00%**) pupils were involved in the study, the males were 81(**54.00%**), and the females were 69(**46.00%**).

Table 2: Various Classes of the Respondents

Classes	Frequency (f)	Percentage (%)	Male		Female	
			(f)	(%)	f	(%)
Primary 1	25	16.7	16	10.67	9	6.00
Primary 2	25	16.7	13	8.67	12	8.00
Primary 3	25	16.7	15	10.00	10	6.67
Primary 4	25	16.7	13	8.67	12	8.00
Primary 5	25	16.7	15	10.00	10	6.67
Primary 6	25	16.7	9	6.00	16	10.67
Total	**150**	**100**	**81**	**54.00**	**69**	**46.00**

Source: Field Survey, 2017

Table **2** above shows the six classes of the respondents. 25(**16.7%**) pupils were drawn from were either of the classes in the study area. In primary 1, out of the 25(**16.7%**) respondents, 16(**10.67%**) are males and 9(**6.00%**) are females. In primary 2, out of the 25(**16.7%**) respondents, 13(**8.67%**) were males and 12(**8.00%**) are females. In primary 3, out of the 25(**16.7%**) respondents, 15(**10.00%**) were males and 10(**6.67%**) are females. In primary 4, out of the 25(**16.7%**) respondents, 13(**8.67%**) were males and 12(**8.00%**) females. In primary 5, out of the 25(**16.7%**) respondents, 15(**10.00%**) were males and 10(**6.67%**) were females. While in primary 6, out of the 25(**16.7%**) respondents, 9(**6.00%**) were males and 16(**10.67%**) were females.

Table 3: Various Sources of Water Used by the Respondents

Water Source	Frequency (f)	Percentage (%)	Males		Females	
			(f)	(%)	(f)	(%)
Well	59	39.33	27	18.00	32	21.33
Tap	12	8.00	4	2.70	8	5.30
Borehole	18	12.00	11	7.30	7	4.70
Well & Borehole	26	17.33	20	13.33	6	4.00

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Tap & Borehole	13	8.67	6	4.00	7	4.67
Tap & Well	22	14.67	13	8.67	8	5.30
Total	**150**	**100**	**81**	**54**	**69**	**46**

Source: Field Survey, 2017

Table **3** indicates the various sources of water used by the respondents of **ECWA** Nursery and Primary School, Kaltungo. The respondents were selected based on their sources of domestic water supply. A total number of 150(**100.00%**) pupils, comprising of 81(**54.00%**) males and 69(**46.00%**) females were selected for the study. 59(**39.33%)** of the respondents, comprising of 27(**18.00%**) males and 32(**21.33%**) females used only well water. 12(**8.00%**) of the respondents made of 4(**2.70%**) males and 8(**5.30%**) female used tap water. 18(**12.00%**) of the respondents, comprising of 11(**7.30%**) males and 7(**4.70%**) females used borehole water. 26(**17.33%**) of the respondents, in which 20(**13.33%**) were males and 6(**4.00%**) females used well & borehole water. 13(**8.67%**) of the respondents made of 6(**4.00%**) males and 7(**4.67%**) females used tap & borehole water. Lastly, 22(**14.67%**) of the respondents, out of which 13(**8.67%**) were males and 8(**5.30%**) females used tap & well water.

Table 4: Level of Fluorosis Observed Among the Respondents Based on Dean's Index

Dean's Index of Fluorosis	Frequency (f)	Percentage (%)	Males		Females	
			(f)	(%)	(f)	(%)
0	36	24.00	24	16.00	12	8.00
0.5	27	18.00	11	7.33	16	10.67
1	15	10.00	7	4.67	8	5.33
2	29	19.33	17	11.33	12	8.00
3	21	14.00	12	8.00	9	6.00
4	22	14.67	10	6.67	12	8.00
Total	**150**	**100**	**81**	**54.00**	**69**	**46.00**

Source: Field Survey, 2017

Table **4** above shows the level of fluorosis observed among the respondents of ECWA nursery and primary school rated according to Dean's index. It was observed from the 150(**100.00%**) of the respondents in the study that, 36(**24.00%**) comprising of 24(**16.00%**) males and 12(**8.00%**) females had a 0 index score that represents a normal dentition. 27(**18.00%**) comprising of 11(**7.33%**) males and 16(**10.67%**) females had 0.5 index score that represent a questionable condition. 15(**10.00%**) consisting of 7(**4.67%**) males and 8(**5.33%**) females had an index score of 1 representing a very mild condition. Also, 29(**19.33%**) of the respondents, comprising of 17(**11.33%**) males and 12(**8.00%**) females had an index score of 2 that represents a mild condition. 21(**14.00%**) consisting of 12(**8.00%**) males and 9(**6.00%**) females had an index score of 3 that represents a moderate condition. Lastly, 22(**14.67%**) of the respondents comprising of 10(**6.67%**) males and 12(**8.00%**) females had an index score of 4which represents a severe condition.

Table 5: Gender/sex Mostly Affected

Occurrence	Frequency (f)	Percentage (%)	Males		Females	
			(f)	(%)	(f)	(%)
Yes	114	76.00	57	38.00	57	38.00
No	36	24.00	24	16.00	12	8.00
Total	**150**	**100**	**81**	**54.00**	**69**	**46.00**

Source: Field Survey, 2017

Table **5** above indicates that from the 150(**100.00%**) respondents in ECWA Nursery and Primary School Kaltungo, 114(**76.00%**) of the respondents had dental fluorosis. In which 57(**38.00%**) are males and 57(**38.00%**) females. While 36(**24.00%**) of the respondents have no dental fluorosis comprising of 24(**16.00%**) males and 12(**8.00%**) females.

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Table 6: Oral Hygiene Status of the Respondents in Relation to Level of Fluorosis Based on the Dean's Index

Oral Hygiene Status / Dean's Index	Fair				Poor				Very Poor			
	Male		Female		Male		Female		Male		Female	
	f	%	f	%	f	%	f	%	f	%	f	%
0 {36:24.00%}	14	9.33	7	4.67	10	6.67	5	3.33	0	0.00	0	0.00
0.5 {27:18.00%}	6	4.00	8	5.33	2	1.33	7	4.67	3	2.00	1	0.67
1 {15:10.00%}	3	2.00	4	2.67	3	2.00	2	1.33	1	0.67	2	1.33
2 {29:19.33%}	9	6.00	5	3.33	6	4.00	6	4.00	2	1.33	1	0.67
3 {21:14.00%}	8	5.33	6	4.00	3	2.00	3	2.00	1	0.67	0	0.00
4 {22:14.67%}	4	2.67	6	4.00	3	2.00	6	4.00	3	2.00	0	0.00
Total	**44**	**29.33**	**36**	**24.00**	**27**	**18.00**	**29**	**19.33**	**10**	**6.67**	**4**	**2.67**

Source: Field Survey, 2017

Table **6** shows the oral hygiene status of the respondents in relation to the level of fluorosis based on Dean's index. From the data, 36(**24.00%**) of the participants has 0 index score "normal condition" in which 14(**9.33%**) males and 7(**4.67%**) females has fair oral hygiene status and 10(**6.67%**) males and 5(**3.33%**) females has poor oral hygiene status. 27(**18.00%**) of the participants has 0.5 index score "questionable condition" in which 6(**4.00%**) males and 8(**5.33%**) females has a fair oral hygiene status; 2(**1.33%**) males and 7(**4.67%**) females has a poor oral hygiene status, whereas 3(**2.00%**) males and 1(**0.67%**) female has a very poor oral hygiene status. Also, 15(**10.00%**) of the participants has 1 index score "very mild condition", in which 3(**2.00%**) males and 4(**2.67%**) females are with a fair oral hygiene status; 3(**2.00%**) males and 2(**1.33%**) females has a poor oral hygiene status; 1(**0.67%**) male and 2(**1.33%**) females are with a very poor oral hygiene status.29(**19.33%**) of the participants has 2 index score "mild condition" in which 9(**6.00%**) males and 5(**3.33%**) females are with a fair oral hygiene status; 6(**4.00%**) males and 6(**4.00%**) females are with poor oral hygiene status; 2(**1.33%**) males and 1(**0.67%**) female are with a very poor oral hygiene status. 21(**14.00%**) of the participants, has 3 index score "moderate condition" in which 8(**5.33%**) males and 6(**4.00%**) females are with a fair oral hygiene status; 3(**2.00%**) males and 3(**2.00%**) female with a poor oral hygiene status; and 1(**0.67%**) male with a very poor oral hygiene status. 22(**14.67%**) of the participants has 4 index score "severe condition", in which 4(**2.67%**) males and 6(**4.00%**) females are with a fair oral hygiene status; 3(**2.00%**) males and 6(**4.00%**) female are with a poor oral hygiene status; and 3(**2.00%**) males are with a very poor oral hygiene status.

IV. DISCUSSION & CONCLUSION

The study was carried out between May and October 2017 to find out the prevalence of dental fluorosis among pupils attending Nursery and Primary School, Kaltungo Local Government Area, Gombe State, Nigeria. From the data analyzed 150 pupils were involved in the study. The main objectives of the study is to identify the prevalence and severity of dental fluorosis through the oral examination of their mouth. From the data in table **1**, 150(**100.00%**) pupils were used for the study, and were selected using the stratified sampling technique, in which 81(**54.00%**) were males and 69(**46.00%**) females. This shows that more males than females are involved in the study. The participants mouth was observed, and findings was recorded on a data sheet. Data In table **4**, shows that 114(**76.00%**) of the respondents have dental fluorosis, of which 27(**18.00%**) was questionable, 15(**10.00%**) was very mild, 29(**19.33%**) was mild, 21(**14.00%**) was moderate, 22(**14.67%**) was severe and only 36(**24.00%**) had normal set of teeth without dental fluorosis. The oral hygiene status of the participants in relation to the level of fluorosis based on Dean's index, reveal that 36(**24.00%**) of the participants has 0 index score "normal condition" in which 14(**9.33%**) males and 7(**4.67%**) females has fair oral hygiene

status and 10(**6.67%**) males and 5(**3.33%**) females has poor oral hygiene status. 27(**18.00%**) of the participants has 0.5 index score "questionable condition" in which 6(**4.00%**) males and 8(**5.33%**) females has a fair oral hygiene status; 2(**1.33%**) males and 7(**4.67%**) females has a poor oral hygiene status, whereas 3(**2.00%**) males and 1(**0.67%**) female has a very poor oral hygiene status.

Also, from data results in table **6**, it was identified that 15(**10.00%**) of the participants has 1 index score "very mild condition", in which 3(**2.00%**) males and 4(**2.67%**) females are with a fair oral hygiene status; 3(**2.00%**) males and 2(**1.33%**) females has a poor oral hygiene status; 1(**0.67%**) male and 2(**1.33%**) females are with a very poor oral hygiene status.29(**19.33%**) of the participants has 2 index score "mild condition" in which 9(**6.00%**) males and 5(**3.33%**) females are with a fair oral hygiene status; 6(**4.00%**) males and 6(**4.00%**) females are with poor oral hygiene status; 2(**1.33%**) males and 1(**0.67%**) female are with a very poor oral hygiene status. 21(**14.00%**) of the participants, has 3 index score "moderate condition" in which 8(**5.33%**) males and 6(**4.00%**) females are with a fair oral hygiene status; 3(**2.00%**) males and 3(**2.00%**) female with a poor oral hygiene status; and 1(**0.67%**) male with a very poor oral hygiene status. 22(**14.67%**) of the participants has 4 index score "severe condition", in which 4(**2.67%**) males and 6(**4.00%**) females are with a fair oral hygiene status; 3(**2.00%**) males and 6(**4.00%**) female are with a poor oral hygiene status; and 3(**2.00%**) males are with a very poor oral hygiene status. This agrees with [12]assertion that there is much fluoride level in drinking water above 1ppm in the area.

From the result, it was also seen that the most prevalent dental fluorosis that affects the participants is mild dental fluorosis at 29(**19.33%**) and questionable dental fluorosis at 27(**18.00%**). Other pupils are affected with a moderate dental fluorosis at 21(**14.00%**) and severe dental fluorosis also at 22(**14.67%**). This finding also agrees with[17]study, which identified children with mixed dentition, to have a higher prevalence and severity of fluorosis in the permanent teeth. Result from table **3**, shows that the source of water used by greater number of the participants is well at 59(**39.33%**) as well as well and borehole at 26(**17.33%**). This findings agrees with the assertion of[13],that those who drank from streams appeared more likely to have fluorosis. The result of hypothesis shows a value of **76**. This simply mean that dental fluorosis is prevalent among the pupils of **ECWA** Nursery and Primary School in Kaltungo Local Government Area of Gombe State, Nigeria. Therefore, reduction of fluoride level in drinking water should be done by the water cooperation to check the fluoride concentration of tap, well and borehole water at regular intervals, and use of extra fluoride supplement should be discouraged unless recommended by a dental professionals.

V. RECOMMENDATION

Based on the finding derived from this study, the researcher, made the following recommendations:

1.Government should implement defluoridation measures of water found in the area, in order to reduce the fluoride level to 0.5 – 0.7 ppm as suggested for tropical climates. Thus, preventing the incidence of fluorosis that has some psychological and sociological effect in the people in the area.

2.Dental healthcare post should be made available in the area with well-trained members of the dental team to pioneer the activities the dental health post in relationship to fluorosis prevention and treatment that includes bleaching with 30% hydrogen peroxide (5 parts) and ethyl other (1 part) for very mild fluorosis and full artificial anterior crowns.

3.Due to the high cost of fluoride analysis, government should sponsor such research work to improve the aesthetics, psychological, and sociological needs of the people with respect to fluorosis which has a lot of negative effect especially on the adolescents in areas with high prevalence of dental fluorosis.

4.Oral health education should be incorporated into the existing health care outposts and good oral hygiene should also be maintained.The people should be educated in the use of the defluoridated water source for their cooking anddrinking. Also use of fluoridated toothpaste, milk, supplements, food should be emphasize while the other water should be used for their domestic activities like washing and bathing.

5.The state government should secure the services of water scientists in the state water board and give them the basic requirements to check the fluoride concentration of the society water source at regular intervals.

6. Dental health workers should carry out more research work in other areas of the state in order to help find out and determine level of fluoride in their water and plan action based on their findings.

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