

Prevalence of dental caries in children with dental fluorosis

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Abstract

Background: Fluoride is often termed as double edged sword as it prevents caries but may also cause fluorosis. Excess amount of fluoride content in water not only causes dental fluorosis but also causes caries in those fluorosed teeth. Aim: The purpose of this study was to determine the prevalence of caries in children having dental fluorosis. Settings and design: It was a cross sectional study done at Bagalkot city of Karnataka. Materials and methods: One hundred children having dental fluorosis, of age group 9-13years were selected and were divided into 5 age groups. These children were assessed for dental fluorosis using Dean’s fluorosis Index and dental caries using WHO modified DMFT index. Results: The study revealed increased incidence of caries (mean DMFT: 2.0) in children having severe fluorosis and low caries incidence (mean DMFT: 0.53) in children having mild fluorosis. Conclusion: This study concluded

that caries go hand in hand with moderate to severe fluorosed teeth.

Keywords: Caries, Dean’s Fluorosis Index, Fluorosis, WHO Modified DMFT Index.

Introduction

Fluoride has been identified as a miracle, dating back to the time that agriculture replaced hunting and gathering as the principle source of food. Although it exerts its maximum cariostatic effect when incorporated into dental enamel during development, with the increase in levels of fluoride, enamel changes in structure and composition, resulting in enamel fluorosis. Mildly fluorosed enamel is fully functional, and is more resistant to acid attack and higher levels of fluoride results in porous, pitted, and discolored enamel which is more prone to caries.^[1]

Fluorosed enamel is characterized by retention of amelogenins in the early- maturation stage and formation of a more porous enamel with a subsurface hypomineralization resulting in caries. Mechanism which

has been proposed as a reason for the enamel defects found in enamel fluorosis includes a systemic effect on fluoride on calcium homeostasis, direct effects on extracellular proteins and proteinases, and specific effects on cell metabolism and function.^[2]

Dental fluorosis if not prevented during childhood can lead to hampered dental esthetics, while the milder forms do not compromise oral health or function or esthetics. Independent to fluoride concentration in drinking water, caries prevalence has been seen to increase with increasing severity of dental fluorosis.^[3]

Fluorosis is endemic; more than 20 states in India have excess of fluoride in ground water.^[3] Bagalkot district is also one of the fluoride endemic areas of Karnataka having fluoride content ranging from 1.6 to 11ppm as given by groundwater quality characterization analyzed by RDED and hence a study was conducted in this city to assess caries experience in children having fluorosis.

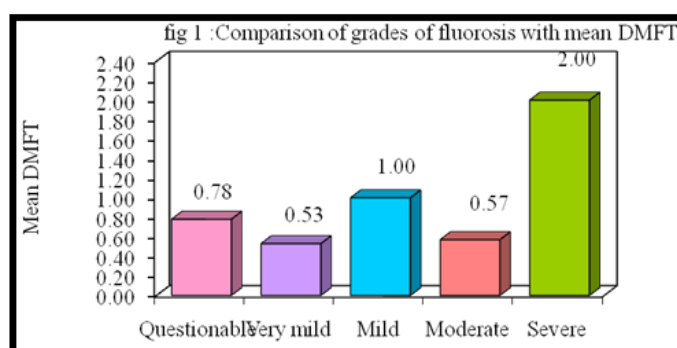
Materials & methods

Hundred school children of Bagalkot city, between the ages of 9-13years, having different degrees of fluorosis were selected and were divided into 5 groups. Group I: 9year old children, Group II: 10year old children, Group III: 11year old children, Group IV: 12year old children, Group V: 13year old children. Out of hundred children 50 were females and 50 were males. All these children were assessed for dental fluorosis using modified Dean's fluorosis index and dental caries according to WHO modification of DMF index. Consent was taken from parents as well as from school authorities. Information was collected via a structured proforma which included demographic variables along with scores of dental fluorosis and caries. Children who were migrated from other places and those who stayed in Bagalkot for very short period of time were discarded from study. All data was compiled and subjected to statistical analysis using

Scheffe's multiple post hoc procedures, one way ANOVA test and Chi-square test.

Results

The sample was divided into 5 groups consisting of 50 males and 50 females. Group I consists of 9year old children[14%], group II -10year old [45%], group III – 11year [16%], group IV – 12year [7%], group V-13year [18%]. The mean DMFT score of 2 was seen with children having severe type of fluorosis, and mean DMFT score of 0.53 was seen with children showing very mild graded fluorosis [Fig: 1].



In group I out of 14 children, 6 children had questionable fluorosis with mean DMFT of 0.33, 5 had very mild fluorosis with mean DMFT of 0.8, one child had mild fluorosis with mean DMFT of 4.0, one child had moderate fluorosis with mean DMFT of 2.0, one child had severe fluorosis with mean DMFT of 1.0 and In group II, out of 45 children, 12 children had questionable fluorosis with mean DMFT of 1.17, 19 had very mild fluorosis with mean DMFT of 0.47, 6 had mild fluorosis with mean DMFT of 0.50, 4 had moderate fluorosis with mean DMFT of 0.50 and 4 had severe fluorosis with mean DMFT of 1.75. In group III, out of 16 children, 10 children had questionable fluorosis with mean DMFT of 0.80, 1 had very mild fluorosis with mean DMFT of 2.0, 3 had mild fluorosis with mean DMFT of 1.67, 1 had moderate fluorosis with mean DMFT of 0 and 1 had severe fluorosis with mean DMFT of 0. In group IV, out of 7 children, 2 children had questionable fluorosis with

mean DMFT of 0.0, 3 had very mild fluorosis with mean DMFT of 0.0, 1 had mild with mean DMFT of 0.0, none were in moderate and 7 had severe fluorosis with mean DMFT of 2.0. In group V, out of 18 children, 7 children had questionable fluorosis with mean DMFT of 0.71, 6 had very mild fluorosis with mean DMFT of 0.43, 1 had mild fluorosis with mean DMFT of 0.67, 1 had moderate with mean DMFT of 0.0 and 1 had severe fluorosis with mean DMFT of 1.0. [Fig: 2] [Table: 1]

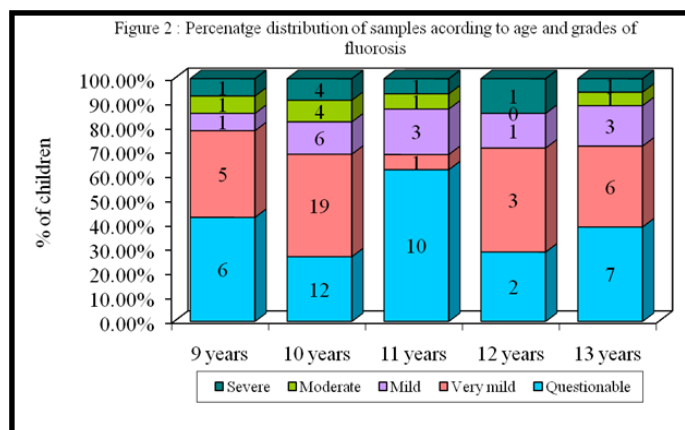


Table 1: Comparison of severity of fluorosis with respect to DMFT in each age by one way ANOVA

Grades of fluorosis	9 years		10 years		11 years		12 years		13 years	
	Means	Std.Dev.	Means	Std.Dev.	Means	Std.Dev.	Means	Std.Dev.	Means	Std.Dev.
Questionable	0.33	0.52	1.17	1.53	0.80	1.14	0.00	0.00	0.71	0.95
Very mild	0.80	1.30	0.47	0.77	2.00	0.00	0.00	0.00	0.43	0.79
Mild	4.00	0.00	0.50	0.84	1.67	2.08	0.00	0.00	0.67	1.15
Moderate	2.00	0.00	0.50	1.00	0.00	0.00	-	-	0.00	0.00
Severe	1.00	0.00	1.75	2.36	5.00	0.00	2.00	0.00	1.00	0.00
Total	0.93	1.27	0.78	1.24	1.25	1.61	0.33	0.82	0.58	0.84
F-value	3.5397		1.3619		2.5419		-		0.2436	
P-value	0.0533		0.2643		0.0995		-		0.9088	

Discussion

Bagalkot is one of the fluoride endemic areas in Karnataka. Fluoride content ranges from 1.6-11ppm. The present study observed that highest number of caries was in severe graded fluorosis and least with very mild graded fluorosis. Distribution of fluorosis was same in both males and females where as in a study, percentage of fluorosis was more in males as compared to females.^[4]

Probable reason for why the caries is less in very mild graded fluorosis can be because once fluoride gets incorporated during enamel mineralization, there will be hydrolysis of acidic precursor of octacalcium phosphate and precipitation of fluoridated apatite crystals occur. The precipitation of fluoridated apatite crystals then reduces the solubility of mineral hence reducing caries.^[2]

But as fluoride uptake increases, fluorosed enamel shows characteristic retention of amelogenins in the early

maturation stage and formation of more porous enamel with a subsurface hypomineralization. The mechanism by which fluoride affects enamel development includes specific effects on both the ameloblast modulation and on developing enamel matrix. In maturation stage ameloblast modulation is more rapid in fluorosed enamel as compared to normal enamel where as proteolytic activity is reduced in enamel with fluorosis.^[5] Fluoride has its effect on secretory type of enamel. Fluoride also impairs matrix biosynthesis, alters protein secretion and has direct effects on extracellular protein and proteinases.^[1] All the above mentioned factors lead to enamel defect or porosity. This porosity can further harbor micro-organisms which lead to caries. So these can be the possible chances why in our study caries is high in children having severe fluorosis. Our study has got similar results as compared other studies done by Wondwossen F in Ethiopia,^[6] Grobleri SR

in South Africa^[7], who found a positive relation between caries and fluorosis but results of our study are in contrast to the study done by Kotecha PV who found less caries in high fluoridated area as compared to low fluoridated area.^[8]

Conclusion

Further longitudinal studies are required to enhance our knowledge of prevalence of caries in such endemic areas. Our study concludes that dental caries is seen in conjunction with fluorosis. But however fluoride cannot be a single common causative factor for either increase or decrease of caries. Various factors like dietary intake, oral hygiene methods, geographic location, socioeconomic status, etc, should be considered before arriving at a conclusion.

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