Int J Biol Med Res. 2011; 2(3):716-720

BioMedSciDirect Publications

Contents lists available at BioMedSciDirect Publications

International Journal of Biological & Medical Research

Journal homepage: www.biomedscidirect.com

Original Article

Study of Dental fluorosis among primary school children residing in Rural area of Raichur District, Karnataka

Abhay B Mane[*a], S. Revathi[b] , Pradeep G Savale[c] , C Niranjan Paul[d] , Shashidhar G Hiremath[e]

[*a] *Associate Professor, b Postgraduate student, c Assistant Professor, d Professor&*
[e] *Professor & HOD, Department of Community Medicine, Navodaya Medical College, Raichur, Karnataka, INDIA- 584103*

ARTICLE INFO

Keywords:
School children
Dental fluorosis
Dean's index
CFI

ABSTRACT

Objectives: To assess the prevalence and severity of dental fluorosis using Dean's index. To compute community fluorosis index(CFI). Study Settings & Design: A school based cross sectional study among the primary students residing in the rural area. Materials & Method: A total of 647 children who were residents of the study area since birth were examined to identify presence of dental fluorosis and grade it using Dean's index.CFI was computed by summing the individual grades and dividing by the total sample size. Statistical Analysis: Data was analysed using SPSS 12.0. Data expressed as Proportions and test applied were Chi-square test, Chi-square test for trend and Correlation Coefficient. Results: The prevalence of dental fluorosis was 32.6% in study population. The prevalence was higher in boys and students who consumed bore well water. CFI showed positive correlation with water fluoride levels. The calculated community fluorosis index (CFI) was 0.44 indicating that the prevalence and severity of dental fluorosis was borderline in 4 villages for public health significance in the sample. Conclusion: Necessary steps to be taken by authorities to provide partially defluoridated water for drinking purpose.

1. Introduction

Fluorine is essential for normal growth, development and maintenance of human health. Fluoride plays an important role in preventive dentistry due to its cariostatic potential. However, excessive intake of fluoride leads to dental and skeletal fluorosis. The main dietary source of fluoride is drinking water. Nearly 12 million of the 85 million tons of fluoride deposits on the earth's crust are found in India [1, 2]. About 62 million people in India suffer from dental, skeletal and non skeletal fluorosis. Of these, 6 million are children below the age of 14 years [3]. Fluorosis continues to remain a challenging national dental health problem as it is endemic in 15 states of India including Karnataka [4, 5].

The incidence of very high levels of fluoride is in the eastern and southeastern belt of Karnataka, covering districts of Gulbarga, Raichur, Bellary, Chitradurga, Tumkur and Kolar and is scattered in rest of Karnataka. District Raichur has non-permissible levels of 13 to 31.9 % fluoride prevailing in many villages [6]. The numbers of taluks falling under high fluoride category in Raichur district remain almost the same over the years. Dental fluorosis is the most sensitive sign of prolonged high fluoride exposure [1]. There is a need for constant monitoring of fluoride exposures in the population. Rural population who are mainly dependent on ground water for drinking purpose are worst affected.

There are few studies on dental fluorosis in the North East districts of Karnataka, but none from Raichur. Hence a study was undertaken to find out the prevalence of dental fluorosis among the primary school children and to explore the possible risk factors for it.

* Corresponding Author : Dr. Abhay B Mane
Associate Professor,
Department of Community Medicine
Navodaya Medical College,
Raichur, Karnataka, INDIA
Email: drabmane@yahoo.co.in

2. Materials and Method

2.1.Study Design

A cross-sectional study involving primary school students aged between 5-10 years. Study Area: Rural field practice area of Medical College which consisted of total 6 villages and 10,000 population approximately. The study area is economically backward with agriculture as one of the main occupation. The majority of people here are from lower socioeconomic class. There are six Government Primary schools, one Private primary school and two high schools.

2.2.Study Population

Data was collected from all the primary school children who were residents of the area since birth and consumed water from the same source. *Inclusion criteria*: School children who are residents of the study area since birth. Exclusion criteria: School children who have recently migrated and are not residents of the study area.

2.3.Data Collection

Ethical permission was taken from Institutional Ethics Committee before the start of study. Written consent was obtained from the District Education Officer, Raichur. Informed consent was taken from the respective Principal of the school for examination of students. Parents were informed to be present on the day of examination and informed verbal consent was taken. Data was collected through school records, interview and clinical examination. The recent reports of fluoride levels of water sources estimated by Panchayat Raj Engineering Division(PRE) , Raichur were obtained.

2.4.Oral examination and Calibration of Examiner:

Oral examination was performed by a Postgraduate student of Community Medicine after undergoing training for one week in Navodaya Dental College. The presence and severity of dental fluorosis was recorded using Dean's Index (1942) on the WHO (1997) modified oral health assessment form [7, 8, 9, 10]. Community Fluorosis Index (CFI) was computed by summing up the scores of individual grades of dental fluorosis as per Dean's criteria and dividing the sum by the total sample size. Villagewise CFI was calculated to identify villages if dental fluorosis was a public health problem [11]. Calibration of the examiner was done during the study by conducting re-examination of 10 % of children with fluorosis. The re-examination was done by a dentist from Department of Community Dentistry. The intra-examiner agreement was assessed with kappa statistics. (> 76 %)

2.5.Dean's Index and Community Fluorosis Index:

An index for assessment of dental fluorosis using a six point scale was developed by Trendley H. Dean [6]. Each tooth in the mouth was rated according to one of the six categories of Dean's index, and the individual's dental fluorosis score was arrived at based on the severest form recorded for two or more teeth. The public health significance of CFI values [12] as shown in table 1

Table 1. Public Health Significance of CFI values

CFI value range	Public health significance
0.0-0.4	Negative
0.4-0.6	Borderline
0.6-1.0	Slight
1.0-2.0	Medium
2.0-3.0	Marked
3.0-4.0	Very marked

2.6. Fluoride levels in drinking water were obtained from the Panchayat Raj Engineering (PRE) Division, Raichur District and the reports provided were used for analysis and correlation.

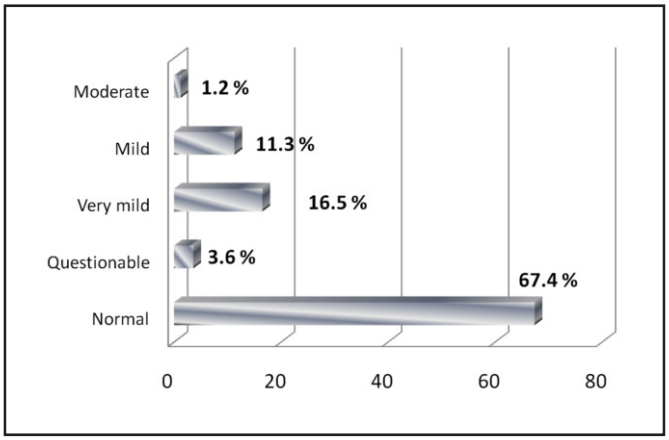
3.Results and Discussion

The study comprised oral examinations of 647 school children aged 5-10 years studying in primary schools. Total enrolment of students was 670. The remaining 23 students were chronic absentees and school dropouts altogether and could not be examined. The studied sample comprised of 334 (51.6 %) boys and 313(48.4 %) girls (Table 2). Majority of children belonged to class III (51.2 %) and class IV (23.6 %) socioeconomic status as per modified B.G. Prasad classification. Oral hygiene habits, dietary habits, amount and source of drinking water are shown in Table 3.

Table 2. Age and Gender distribution of students.

Age category	Gender		
	Boys (%)	Girls (%)	Total (%)
5 & 6 years	109 (42.1)	150 (57.9)	259 (100)
7 & 8 years	156 (56.7)	119 (43.3)	275 (100)
9 & 10 years	69 (61.1)	44 (38.9)	113 (100)
TOTAL	334 (51.6)	313 (48.4)	647 (100)

Fig.1.Bar chart showing the distribution of students by Dean's Fluorosis Index.



The overall prevalence of dental fluorosis was 32.6 % and 29 % if questionable category was subtracted. The proportion of students with very mild and mild dental fluorosis category as per Dean's index was 16.5 % and 11.3 % respectively as depicted in figure 1. This finding is similar to other studies done earlier [13, 14]. A higher prevalence of 92.73% was noted among school children in the village of Juai Kalan, Bhiwani District, Haryana [15].Similarly a study undertaken in the adjoining Kheru Tanda, Gulbarga District reported 89 % prevalence of dental fluorosis[16]. Severe fluorosis which may be perceived as an aesthetic problem was not seen in any of the students [17, 18].Only 1.2 % of students had moderate fluorosis. The milder forms of dental fluorosis do not affect oral health and function (Table 3.)

Table 3. Characteristics of the students

Variable	Value (%)
Boys	51.6
Lower Middle & Low Socioeconomic status	33.7
Age to start brushing-< 2 y	52.4
Frequency of brushing (1 times/day)	89.1
Source of drinking water (borewell water)	68.6
Amount of water consumed (4-6 glasses/day)	58.2
Mixed diet	80.7
Jowar consumption (all days in week)	74.6
Tea intake per day (2 cups)	90.0
Prevalence of dental fluorosis by Deans index	32.6
Severity of dental fluorosis (very mild)	16.5
Caries status (No caries)	56.8

Dental fluorosis was more prevalent among boys than girls but the difference was not statistically significant (Table 4).The same was reported from other studies conducted earlier among rural school children in Karnataka [19], Haryana [20] and Tamil Nadu [2].A higher prevalence among girls was noted from a study done in Kerala [3] . The Prevalence increased with respect to age category of students but was found to be statistically insignificant (Table 4). Caries prevalence was found to be less in children with dental fluorosis and this was found to be statistically significant.

Table 4. Prevalence of dental fluorosis with respect to Gender of the students

Gender	Dental Fluorosis		
	Present (%)	Absent (%)	Total (%)
Boys	112 (33.5)	222 (66.5)	334 (100)
Girls	99 (31.6)	214 (68.4)	313 (100)
Total	211 (32.6)	436 (67.4)	647 (100.0)

(X^2-0.266, df-1, P> 0.05, NS-Not Significant)

Table 5. Prevalence of dental fluorosis with respect to Age of the students

Age category	Dental Fluorosis		
	Present (%)	Absent (%)	Total (%)
5 & 6 years	76 (29.3)	183 (70.7)	259 (100)
7 & 8 years	91 (33.1)	184 (66.9)	275 (100)
9 & 10 years	44 (38.9)	69 (61.1)	113 (100)
TOTAL	211 (32.6)	436 (67.4)	647 (100.0)

(Chi square test for trend, X2-3.272, df-1, P> 0.05, NS-Not Significant)

Table 6. Prevalence of dental fluorosis with Water fluoride levels in Villages.

Village		Dental Fluorosis		
	Fluoride levels[1]	Present (%)	Absent (%)	Total (%)
Bhapur	0.8	49 (33.6)	97 (66.4)	146 (100)
Singanodi Thanda	0.9	25 (52.1)	23 (47.9)	48 (100)
Mandalgiri	1.5	25 (23.1)	83 (76.9)	108 (100)
Bhapur Thanda	1.5	7 (25.0)	21 (75.0)	28 (100)
Wadlamdodi	1.5	26 (31.0)	58 (69.0)	84 (100)
Singanodi	2.0	79 (33.9)	154 (66.1)	233 (100)
TOTAL		211(32.6)	436 (67.4)	647 (100)

[1] in ppm by reports from PRE Division, Raichur. (X^2-13.76, df-5, P< 0.05, S-Significant)

The relationship between the levels of fluoride in drinking water and the incidence of dental fluorosis vary from place to place. In the present study the prevalence also varied between villages (Table 6). A stepwise increase of dental fluorosis was noted with the increase in the water fluoride levels in villages. Previous studies have indicated that the incidence and severity of chronic fluoride intoxication are also greatly influenced by socio-economic, climatic, and nutritional status [21, 22].This might be the reason for high prevalence seen in singanodi Thanda at 0.9 ppm fluoride levels. The high prevalence with low water fluoride could be explained that in an endemic fluorosis area a great amount of fluoride is incorporated into food materials and ingested into the body as explained by A.K. Susheela [23]. Jowar consumption was universal in the study sample and previous studies have reported that its daily consumption had higher risk for dental fluorosis [24].

Table 7. Community Fluorosis Index (CFI) and Village Water fluoride levels.

Village	Fluoride levels[1]	CFI values	Public health significance
Bhapur	0.8	0.40	Negative
Singanodi Thanda	0.9	0.42	Borderline
Mandalgiri	1.5	0.45	Borderline
Bhapur Thanda	1.5	0.22	Negative
Wadlamdodi	1.5	0.52	Borderline
Singanodi	2.0	0.59	Borderline
TOTAL	(Mean CFI-0.44, SD-0.73)		

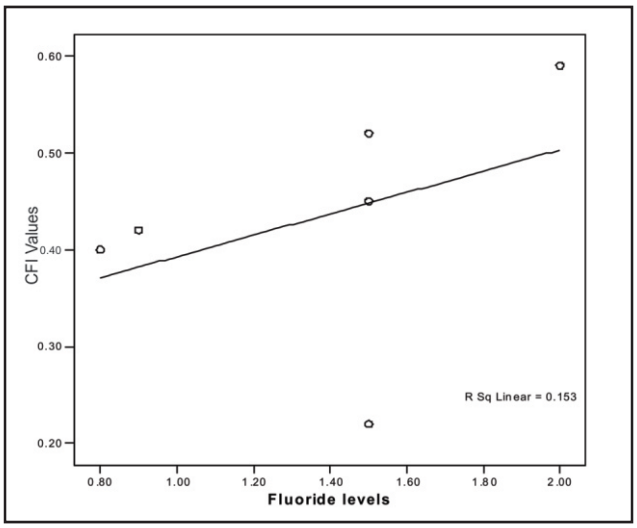
[1] in ppm, reports from PRE Division, Raichur.

Table 7. depicts the prevalence of dental fluorosis along with CFI values in different villages. The highest CFI value of 0.59 and 0.52 was found in Singanodi and Wadlamdodi respectively. The lowest CFI value of 0.22 in Bhapur Thanda indicating negative public health significance

The calculated mean CFI was 0.44 indicating that the prevalence and severity of dental fluorosis was borderline in 4 villages for public health significance in the sample.

We noticed a positive correlation between the fluoride levels and CFI scores which was significant at 0.01 level (Figure 2). Similar findings were reported by other studies also [12, 19].

Fig.2 Linear correlation between water fluoride levels and Community fluorosis Index (CFI) values



4. Limitations of Study

Fluorosis develops at the time of calcification of teeth from infancy and hence the fluoride exposure during this period is of critical importance. This study being cross-sectional, the exact fluoride exposure during calcification of teeth cannot be measured now. Hence it is presumed that the water sources are constant and not changed in last 10-12 years.

5. Conclusion

This study establishes relationship between the water fluoride levels in drinking water and the prevalence of dental fluorosis. It reveals that dental fluorosis is public health problem in rural area of Raichur District. The prevalence varied between the villages from 23.1 % to 52.1 % with increase in water fluoride levels. One village showed high prevalence of dental fluorosis even with low water fluoride level compared with the prevalence in other villages. It is recommended that further study to be undertaken on fluoride intake from other sources like toothpaste, Jowar consumption, tea and diet in these villages. The prevalence of dental fluorosis did not significantly differ in both sexes of students. The findings highlight an urgent need to provide defluoridated drinking water in the affected villages to lower the burden of dental fluorosis.

Acknowledgement:

The authors are thankful to Dr. Kirankumar, Asst.Professor, Dept. of Community Dentistry, Navodaya Dental College, Raichur. We are also thankful to DEO, Raichur and all the Headmasters, teachers and students for their cooperation in the survey. The authors are also thankful to Shri S.R. Reddy, Chairman, Navodaya Education Trust, Raichur for his support and Dr S.R. Hegde, Medical Director, Dr Khaja Naseerudin, Principal for their guidance.

6.References

[1] World Health Organization. Fluorides and Oral Health. WHO technical report series 846. Geneva: World Health Organization; 1994.

[2] Baskaradoss JK, Clement RB, Narayanan A. Prevalence of dental fluorosis and associated risk factors in 11-15 year old school children of Kanyakumari District Tamil Nadu, India: A cross sectional survey. Indian J Dent Res. 2008; 19: 297-303.

[3] Susheela AK. A Treatise on Fluorosis, Fluorosis Research and Rural Development Foundation, New Delhi, 2001.

[4] Gopalkrishnan P, Vasan RS, Sarma PS, Ravindran Nair KS, Hankappan KR.Prevalence of dental fluorosis and associated risk factors in Allappuza District, Kerala. Natl Med J India. 1999; 12: 99-103.

[5] Teotia SP,Teotia M.Endemic Fluorosis in India: A challenging national health problem. J Assoc Physicians India. 1994; 32: 347-52.

[6] Latha S, Ambika SR, Prasad SJ . Fluoride Contamination Status of Groundwater in Karnataka. Current Science. 1998; 76 (6): 730–734.

[7] Dean HT. Classifications of mottled enamel diagnosis. J Am Dent Assoc. 1934, 21:1421-1426.

[8] World Health Organization. Oral health surveys: Basic methods, 4th ed. World health Organization: Geneva; 1997.

[9] Dean HT. Chronic endemic dental fluorosis (mottled enamel). JAMA. 1936; 107:1269-72

[10] Dean, 1942. As Reproduced in "Health Effects of Ingested Fluoride" National Academy of Sciences, 1993; pp. 169.

[11] Murray JJ, Rugg-Gunn AJ, Jenkins GN. Fluorides in caries prevention, 3rd ed. Butterworth-Heinemann Ltd: Oxford. 1991;225-232.

[12] Saravanan S, Kalyani C, Vijayarani MP, Jayakodi P, Felix AJW, Nagarajan S, Arunmozhi P, Krishnan V. Prevalence of Dental Fluorosis Among Primary School Children in Rural Areas of Chidambaram Taluk, Cuddalore District, Tamil Nadu, India. Indian Journal of Community Medicine.2008;33:146-150.

[13] Bharati P, Kubakaddi A, Rao M, Rama K. Naik. Clinical symptoms of dental and skeletal fluorosis in Gadag and Bagalkot Districts of Karnataka. J Hum Ecol.2005; 18(2): 105-107.

[14] Esa R,. Razak IA. Dental fluorosis and caries status among 12-13 year schoolchildren in Klang District, Malaysia. Annal Dent Univ Malaya. 2001; 8: 20-24.

[15] Dahiya S, Kaur A, Jain N. Prevalence of fluorosis among school children in rural area, District Bhiwani: A case study. Indian J Environ Health. 2000;42:192-195 .

[16] AR Shivashankara,YM Shivaraja Shankara,S Hanumanth Rao, P Gopalakrishna Bhat. A clinical and biochemical study of chronic fluoride toxicity in children of Kheru Thanda of Gulbarga District, Karnataka, India. Fluoride.2000; 33 (2): 66-73.

[17] Clark DC. Aesthetic concerns of children and parents in relation to different classifications of the Tooth Surface Index of Fluorosis. Community Dentistry and Oral Epidemiology.1994; 22: 461-4

[18] Riordan PJ. Perceptions of dental fluorosis. J Dent Res. 1993; 72: 1268-1274

[19] Chandrashekhar J, Anuradha KP. Prevalence of dental fluorosis in rural areas of Davangere, India. Int dent J. 2004; 54:235-9[20]Singh AA, Birsingh, Kharbanda OP, Shukla DK, Goswami K, Gupta S. dental fluorosis in rural school children from Haryana. A brief report. Indian J Prev Soc Med. 2001;32:113-5

[21] Sarala Kumari D, Ramakrishna Rao P. Endemic fluorosis in the village Ralla Ananthapuram in Andhra Pradesh, an epidemiological study. Fluoride. 1993; 26(3):177-80.

[22] Teotia SPS, Teotia M. Endemic skeletal fluorosis: clinical and radiological variants (review of 25 years of personal research). Fluoride .1988;21(1):39-44.

[23] Susheela AK. Epidemiology and control of fluorosis in India. J of nutrition foundation of India, April 1984. Available from: http://nutritionfoundationofindia.res.in/pdfs/jun2007-pdf. [Accessed on 1/5/2011]

[24] Chandrashekhar J, Thankappan KR, Sundaram KR. Severe dental fluorosis and jowar consumption in Karnataka, India. Community Dent Oral Epidemiol. 2010; 38: 559-567.