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AN ASSESSMENT OF DENTAL FLUOROSIS IN SCHOOL CHILDREN OF VALLIOOR UNION IN TIRUNELVELI DISTRICT

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ABSTRACT

Background: Fluorosis is an important public health problem in many countries, including India. In the present study, prevalence and severity of dental fluorosis among residents of selected villages of Vallioor union in Tirunelveli District, Tamil Nadu, India, were studied**.** **Methodology**: A total of 470 students aged between 5-16 were selected, examined and oral examination was performed after getting consent from the parents of selected children and the data was collected through the questionnaire. Students with dental fluorosis were examined as per Dean's classification. The fluoride content of the drinking water, Community fluorosis index (CFI) and Fluoride exposure levels of the students were also calculated. **Results:** The highest percentage of dental fluorosis was seen in Lebbaikudieruppu with 75% and Periyanayagipuram with 59.25% and the amount of fluoride present in the drinking water in these areas ranged from 2.1 ppm to 4.6 ppm. The present study indicated that almost all the study areas are high fluorotic as the CFI exceeds 0.6. **Conclusion**: High prevalence of dental fluorosis and high community fluorosis index suggest that fluorosis is a major public health problem in the study areas. **Recommendations:** Fluoride poisoning can be prevented or minimized by using alternative water sources or by removing excessive fluoride (de-fluoridation) from drinking water and they can be advised to include protein rich food (with calcium and vitamin C) in their daily diet.

KEYWORDS: Fluorosis, Fluoride, Vallioor, de-fluoridation, Dean's classification.

INTRODUCTION

Fluorine is the most abundant element in nature and about 96% of fluoride in the human body is found to be present in bones and teeth. Fluorine is essential for the normal mineralisation of bones and formation of dental enamel.[1] The principal sources of fluorine was drinking water and food such as fish, cheese and tea.[2] The recommended level of fluoride in drinking water in India is 0.5 to 0.8 mg/l.[3]

Fluorosis is an important public health problem in 24 countries, including India, which lies in the geographical fluoride belt that extends from Turkey to China and Japan through Iraq, Iran and Afghanistan.[4] About 85 million tons of fluoride deposited on the earth's crust, of which 12 million are found in India.[5] Hence it is natural that fluoride contamination is widespread, intensive and alarming in India. Endemic fluorosis is prevalent in India since 1937.[6] It has been estimated that the total population consuming drinking water containing elevated levels of fluoride is over 66 million.[7] And it was evident that high fluoride concentration in groundwater is a public health problem in India.[8]

The available data suggest that 15 States in India are endemic for fluorosis (fluoride level in drinking water >1.5 mg/l) and about 62 million people in India suffer from dental, skeletal and non-skeletal fluorosis and out of these, 6 million are children below the age of 14 years.[9] Groundwater is considered as the major source of drinking water in most places on earth.[10] Dental fluorosis (DF) has different stages. At first, the teeth become chalky and opaque due to hypomineralization. In extreme DF, the teeth lose enamel and increasingly develop pits and grooves. The severity of DF was first measured using the six levels Dean's index (DI), developed in 1934.[11]

MATERIALS AND METHODS

Description of the study area

The study was conducted in villages such as Kadambankulam, Lebbaikudieruppu, Sivagamipuram, Periyanaygipuram and Rosmeyapuram in Vallioor Union of Tirunelveli district, based on the Fluoride content of drinking water. The climate of these areas is very hot in summer and cold in winter. The monsoon season is in very short duration, annual rainfall is also very low in these areas and surface water may not be available in all seasons for drinking purpose. For this reason people depend on ground water for their use. Drinking water is considered to be the main source of fluorides and standards are fixed by various

authorities for the permissible limit of fluorides. Fluoride in drinking water causing dental fluorosis has been found through many surveys.

Study population

A house to house survey was conducted. Children who were present at the time of examination were also included in the study. It was confirmed that all the participants were continuous residents of the study area since birth. Majority of the people were belong to the low socio-economic class and the principal adult occupations are labours, beedi making and agriculture.

Based on the fluoride level of water (data from Tamil nadu Water supply and Drainage Board-TWAD) the fluorotic areas were selected. Percentage of incidence of fluorosis was calculated from the number of people affected by fluorosis from the respective area with total number of students surveyed. A total of 470 students aged between 5-16 were selected and examined. Oral examination was performed after getting consent from the parents of selected children and the data was collected through the questionnaire. Students with dental fluorosis were examined as per Dean's classification.

Table 1: Total Number of Students Surveyed for Dental Fluorosis.

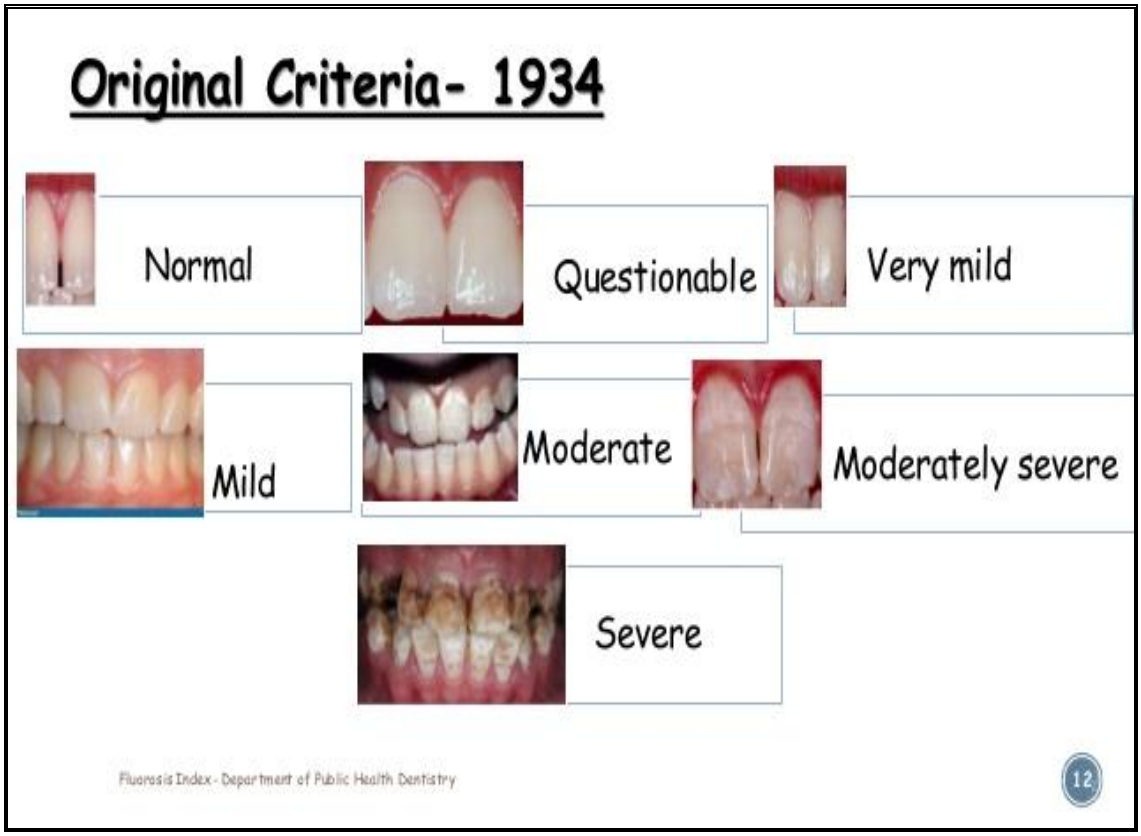
Places	No. in the Sample						Total
	5 To 8		9 To 12		13 To 16		
	Boys	Girls	Boys	Girls	Boys	Girls	
Lebbai-Kudieruppu	13	16	13	14	15	17	88
Kadamban-Kulam	18	19	22	16	18	15	108
Periya-Naygipuram	17	19	23	11	10	13	93
Rosemia-Puram	19	18	16	12	14	16	95
Sivagami-Puram	18	10	13	12	15	18	86
Total	85	82	87	65	72	79	470

Deans Index

The subject should be examined in the upright position, with the examiner facing the subject with his or her back to the light (window). Note the distribution pattern of any defects and decide if they are typical of fluorosis i.e. the defects in the questionable to mild scores (the most likely to occur) may consist of fine white lines or patches usually near the incisal edges or cusp tips. They are paper white or frosted in appearance and tend to fade into the surrounding enamel. The premolars and second molars are most frequently affected followed by the upper incisors. The mandibular incisors are least affected.

If fluorosis is present then decide on the two most severely affected teeth. Dean's Index is scored on the condition of these two teeth. If the two teeth are not equally affected score on the least affected. When scoring, start at the higher end of the Index i.e. severe, and eliminate each score until you arrive at the condition present. If in any doubt the lower score should be given.

Criteria for Dean's Classification System for Dental Fluorosis (1934)



RESULTS

Dental fluorosis prevalence

A total of 470 students aged between 5-16 were selected, examined and oral examination was performed. Students with dental fluorosis were examined as per Dean's classification and the fluoride content of the drinking water, Community fluorosis index (CFI) and Fluoride exposure levels of the students were also calculated.

The overall prevalence of dental fluorosis was 52.76%. The Lebbaikudieruppu region had the highest prevalence of dental fluorosis (75%) followed by Kadambankulam (59.25%). The lowest prevalence was (34.73%) recorded in Rosemiapuram region.

Table No. 2: Prevalence of Fluorosis among the Students in the Study Area.

Places	No of Students Surveyed	No of Students Affected	%
Lebbai-kudieruppu	88	66	75
Kadamban-kulam	108	64	59.25
Periya-naygipuram	93	42	45.16
Rosemia-puram	95	33	34.73
Sivagami-puram	86	43	50.0
Total	470	248	52.76

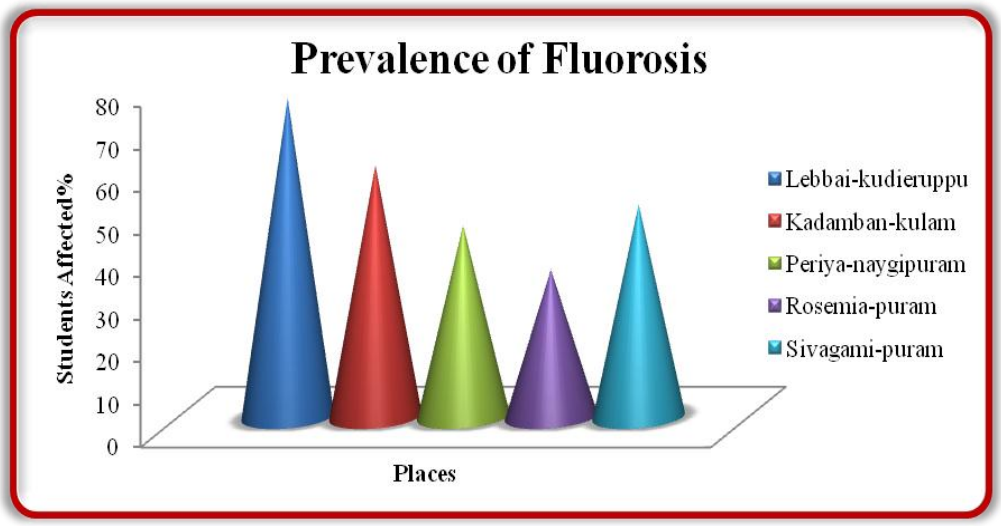


Fig. No. 1: Prevalence of Fluorosis among the Students in the Study Area.

Fluoride levels in drinking water

The high concentrations of fluoride in drinking water refer only to the drinking water from selected wells, which was used before as the only available drinking water. The fluoride content varies from 2.1F-mg/L -4.3 F- mg/L. Lebbaikudieruppu has the highest fluoride with 4.3 F- mg/L. Kadambankulam has the lowest fluoride with 2.1 F- mg/L.

Table No. 3: Fluoride levels in drinking water of the study area.

Places	Fluoride Content F- mg/L
Lebbai-kudieruppu	4.3
Kadamban-kulam	2.1
Periya-naygipuram	3.2
Rosemia-puram	2.5
Sivagami-puram	3.5

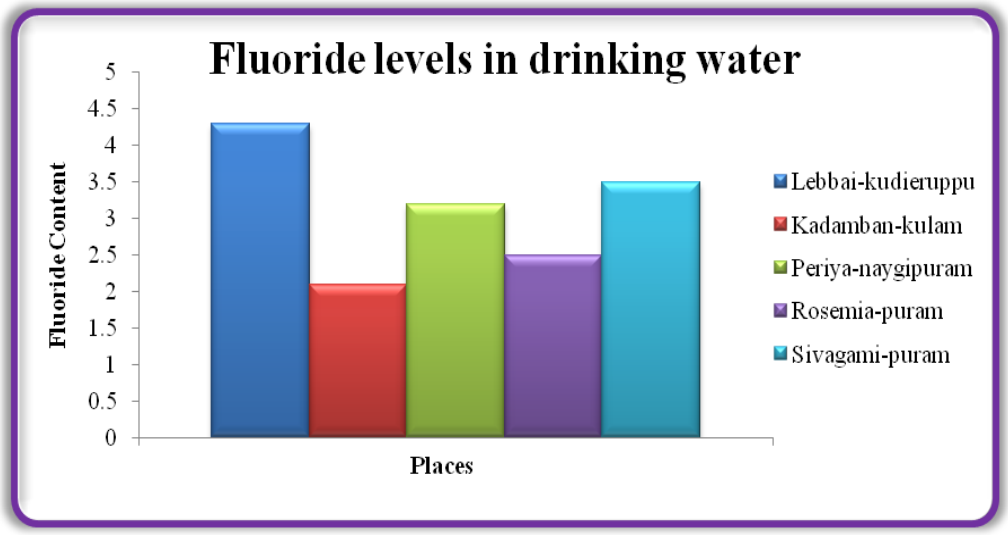


Fig. No. 2. Fluoride levels in drinking water of the study area.

Estimation of fluoride exposure through drinking water

Total daily fluid intake through drinking water was evaluated taking into account the individuals' body weight (bw). The data from the survey indicated that each individual consumes between 0.5 and 3 L of water per day from groundwater sources. These values were used to calculate the amount of daily fluoride intake among four age groups.

Fluoride exposure levels can be calculated using the following formula:

$$\text{Fluoride exposure dose} = \frac{CxWI}{BW}$$

C = concentration of water fluoride level (mg/lr)

WI = water intake (lr/day)

BW = Body weight (kg)

Table No. 4: Fluoride exposure dose of the study area.

Places	Fluoride Content	5-8yrs	9-12	13-16
Lebbai-kudieruppu	4.3	0.258	0.182	0.1112
Kadamban-kulam	2.1	0.126	0.0851	0.0543
Periya-naygipuram	3.2	0.192	0.129	0.0827
Rosemia-puram	2.5	0.15	0.1013	0.0646
Sivagami-puram	3.5	0.21	0.1418	0.0905

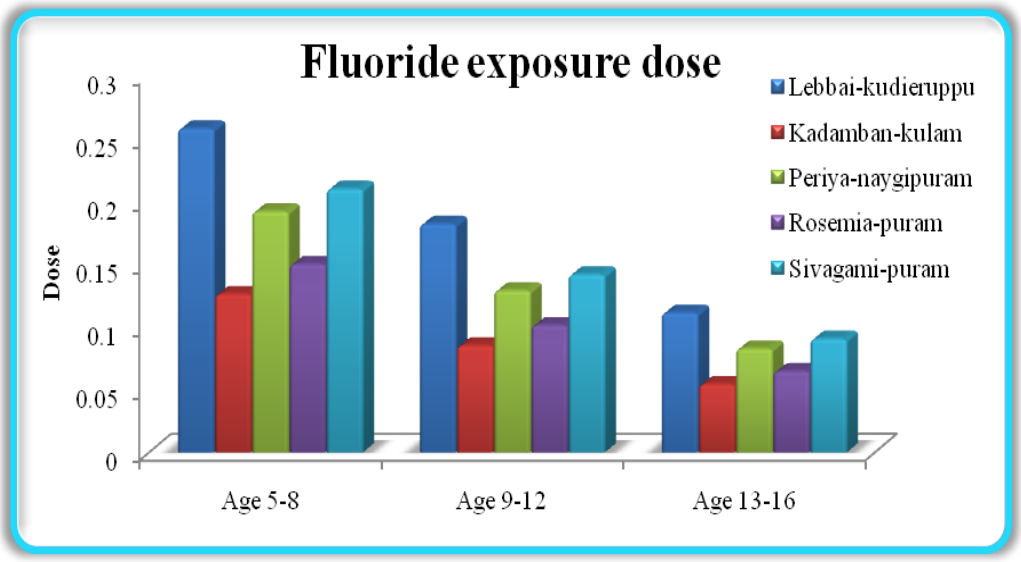


Fig. No. 3: Fluoride exposure dose of the study area.

Determination of fluorosis through CFI

Community fluorosis index was assessed on the basis of dental fluorosis symptoms, which were classified into seven categories according to Dean's classification viz. normal, questionable, very mild, mild, moderate, moderately severe and severe. Each of these seven classifications was given a numerical weight such as 0, 0.5, 1, 1.5, 2, 3 and 4. Community fluoride index can be calculated by the following formula,

$$CFI = \sum \frac{\text{Number of people x Deans numerical weight}}{\text{Total number of people examined}}$$

Table 5: Community Fluorosis Index of the study area.

	0-normal	0.5 questionable		1- Very Mild		1.5 –Mild		2Moderate		3-Moderately Severe		4-Severe		Total	CFI
Lebbai-Kudieruppu	22	11	5.5	9	9	5	7.5	18	36	16	48	7	28	88	1.52272727
Kadamban-Kulam	44	16	8	6	6	7	10.5	12	24	14	42	9	36	108	1.1712963
Periya-Naygipuram	51	14	7	3	3	3	4.5	5	10	9	27	9	36	93	0.94086022
Rosemia-Puram	62	4	2	5	5	4	6	6	12	8	24	6	24	95	0.76842105
Sivagami-Puram	43	7	3.5	-	0	8	12	6	12	12	36	10	40	86	1.20348837

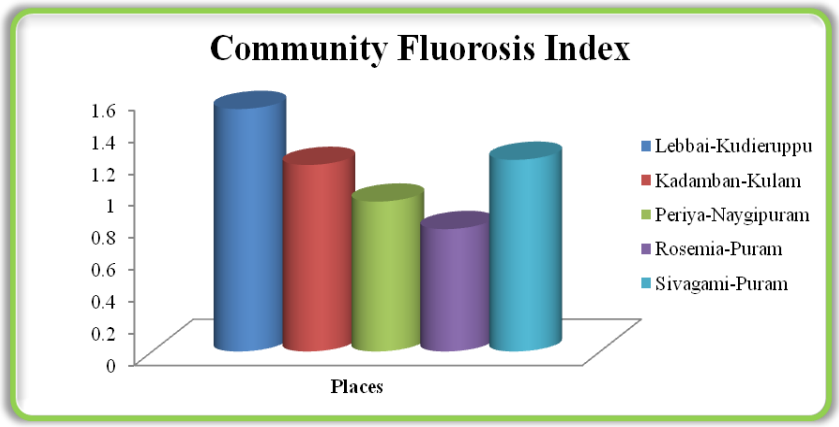


Fig. 4: Community Fluorosis Index of the study area.

Fluorosis is considered to be a public health problem, only when the community fluorosis index value exceeds 0.6 in the respective area. From the study, almost all the study areas are high fluorotic as the CFI exceeds 0.6.

CONCLUSION

This study reveals that the prevalence and severity of dental fluorosis in Vallioor area is very high and this is mainly due to high fluoride levels in ingested water. High prevalence of dental fluorosis and high community fluorosis index suggest that fluorosis is a major public health problem in the study areas.

RECOMMENDATIONS

Fluoride poisoning can be prevented or minimized by using alternative water sources or by removing excessive fluoride (de-fluoridation) from drinking water and they can be advised to include protein rich food (with calcium, vitamin C) in their daily diet.

REFERENCES

1. Park K. Park's text book of preventive and social medicine. Ed 21. Banarasisdas Bhanot Publishers, 1167. Premnagar, Jabalpur, India, 2011; 577.
2. Passmore R, Nicol BM, Rao MN, Beaton GH, Demayer EM. Hand book on Human Nutritional Requirements. Monogr Ser World Health Organ, 1974; (61): 1-66.
3. Jolly SS, Singh ID, Prasad S, Sharma R, Singh BM, Mathur OC. An epidemiological study of endemic fluorosis in Punjab. Indian Journal of Medical Research, Jul, 1969; 57(7): 1333-46.
4. Saravanan S, Kalyani C, Vijayarani M, Jayakodi P, Felix A, 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: 146-50.

5. Teotia SP, Teotia M. Endemic fluorosis in India: A challenging national health problem. Journal of the Association of Physicians of India, 1984; 32(4): 347-52.
6. Shortt HE, Pandit CG, Raghvachari TNS. Endemic fuorosis in Nellore district of South India. Indian Medical Gazette, 1937; 72: 396-400.
7. FRRDF. State of art report on the extent of fluoride in drinking water and the resulting endemicity in India. 1999. Fluorosis Research and Rural Development Foundation, New Delhi, India.
8. Kotecha PV, Patel SV, Bhalani KD, Shah D, Shah VS, Mehta KG. Prevalence of dental fluorosis & dental caries in association with high levels of drinking water fluoride content in a district of Gujarat, India. Indian Journal of Medical Research, 2012; 135(6): 873– 877.
9. Susheela AK. Fluorosis: Indian scienario: A treatise on fluorosis. Fluorosis Research and Rural Development Foundation; New Delhi, India, 2001.
10. Brindha K, Elango L. Fluoride in Groundwater: Causes, Implications and Mitigation Measures. In: Monroy, S.D. (Ed.), Fluoride Properties, Applications and Environmental Management, 111-136.
11. Dean HT. Classification of mottled enamel diagnosis. Journal of the American Dental Association, 1934; 21(8): 1421-1426.