

# **Comparison of Severity of Dental Fluorosis among High School Children in Sivagiri Taluk, Tirunelveli District Tamilnadu, India**

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**ABSTRACT:** To compare the severity of dental fluorosis and socio-economic status of high school children in the study area. A cross-sectional survey was conducted on school children of standards ninth and tenth in Sivagiri Taluk. Proportion of dental fluorosis was calculated by severity, gender and location of school children using Dean's index. Out of 2905 children examined, 643(22.13%) were affected by dental fluorosis. Prevalence of questionable and very mild fluorosis were high when compared to other categories of fluorosis. Defluorinated water is to be supplied to the most endemic fluoride area. Further studies are also needed to find out the reasons and rectify the problems.

**KEYWORDS:** Fluoride, Fluorosis, Dental, Skeletal, Water, Categories, School.

## **I. INTRODUCTION**

Water is very important for plants, animals, human beings and industries. Quality drinking water is very essential for human beings. Availability of safe drinking water is improved nowadays in many parts of the world. But still safe drinking water is not available for about 1 billion people. Water contains many ions. Of these fluoride is a vital in drinking water. Fluoride is the smallest and most electronegative halide ion. Because of its more reactive nature it is present as fluorite and fluorides [1]. Fluoride is present in the environment due to the dissolution of sodium fluoride and fluorosilicates and anthropogenic activities of human beings [2,3]. It is also due to climate, host rocks and hydrogeology [4]. Effluents from industries also contribute to fluoride in water [5,6]. The permissible and safe limit of fluoride in drinking water is 1mg/L. Less than 0.5mg/L leads to dental cavity and more than 1.5mg/L causes dental fluorosis [7]. Still higher level of greater than 6mg/L may result in skeletal fluorosis [8]. Fluoride in ground water varies from 0.5mg/L to 20mg/L [9]. More than 50% villages in India have more than 1mg/L of fluoride in drinking water [10].

60% fluorosis is from other sources of fluoride (food) [11]. 66 million people in India are at the risk of developing fluorosis including 6 million children below the age of 14 whereas 25 million people are already affected by fluorosis [12]. Prevalence of fluorosis increases with increase in duration of exposure to fluoride [13]. Prevalence of dental caries and dental fluorosis and its relation to fluoride in drinking water have been studied in many parts of India [14,15,16]

The aim of this study was to compare the prevalence and severity of dental fluorosis in a group of high school children in association with their socio economic status and locations [17] in Sivagiri taluk, Tirunelveli district, Tamil Nadu in India. Sivagiri taluk is located at the northwest part of Tirunelveli district at 9.33°N and 77.43°E with the elevation of 165meter. It has a municipality three townships and many village panchayats. It has a population of 2

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

lakh people with 99,000 males and 1, 01,000 females. Its literacy rate is 67.47%. Most of the students in this area were from economically backward families with poor education background.

## II. MATERIALS AND METHODS

For collecting data, an initial survey was done in Tirunelveli D.T, related to dental fluorosis. Finally, Sivagiri Taluk was selected as it has more number of school children affected by dental fluorosis. To collect informations from the students a pre-designed questionnaire was prepared and dental examination was carried out with the help of school teachers in bright sun light to identify the severity of dental fluorosis. CFI was calculated using the individual scores and total sample size using Dean’s index. The survey was done between Oct 2013 and March 2014, among the students of standards IX and X in the study area. In this work the boys and girls were examined and interviewed Drinking and ground water samples were also collected and tested for various water quality parameters.

## III. RESULTS

From this survey it was found that out of 2905 children (1328 boys, 1577 girls) of IX and X standard, 643(22.13%) were affected by dental fluorosis. The prevalence of dental fluorosis is more 445(24.54%) in aided schools than government schools 198(18.13%). Overall prevalence of dental fluorosis ranges from 10% to 34.25% in aided schools and 8.31% to 29.68% in government schools respectively.

This survey revealed that 643(22.13%) children were affected by dental fluorosis. It includes 363 boys and 280 girls. Of 363 boys 259(14.29%) were from government aided schools and 104(9.52%) were from government schools. Of 280 girls 186(10.26%) were from government aided and 94(8.61%) from Government schools. (Tables 1 and 2) This is shown in Fig.1

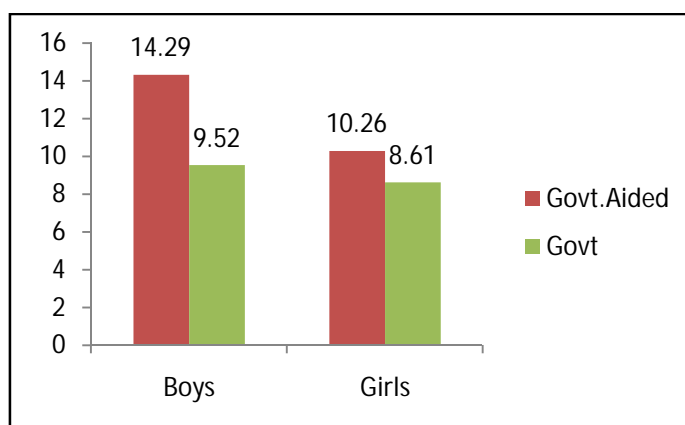


Fig.1. Prevalence of fluorosis in Govt. aided and Govt. schools

It was also observed that prevalence of dental fluorosis is more among boys than girls [17,18] in both government aided schools and government schools. It may be due to the fact that boys generally take drinking water from multiple sources. In the affected area fluoride in drinking water varies from 0.56mg/L to 2.53mg/L. Maximum fluoride (2.53mg/L) was found in Kilapudur, where maximum number of cases were noticed. Out of 25 locations 10 locations have more than 1mg/L of fluoride in drinking water.

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(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

## IV. CATEGORIES

Among affected boys in government aided schools, the overall prevalence of questionable fluorosis was found to be 34.61%, very mild fluorosis was found to be 14.83%, mild fluorosis was 2.92%, moderate fluorosis was 4.27% and moderately severe was 1.57%. Among affected girls in government aided schools, the order of questionable fluorosis was found to be 22.02%, Very mild fluorosis was 11.24%, mild fluorosis was 3.37%, moderate fluorosis was 3.82% and moderately severe was 1.35%. This is shown in Fig.2

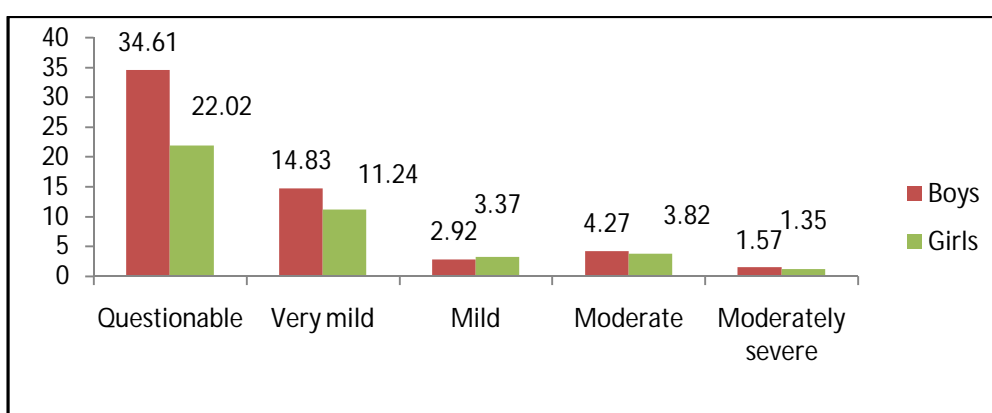


Fig.2. Prevalence of categories of fluorosis in Govt. aided schools

In government Schools the order of categories of fluorosis among boys was found to be 17.68%, 24.24%, 2.53%, 7.07% and 1.01% respectively. Among affected girls in government schools, the order of categories of fluorosis was found to be 11.11%, 22.73%, 3.54%, 8.58% and 1.56% respectively. (Table 3) This is shown in Fig.3

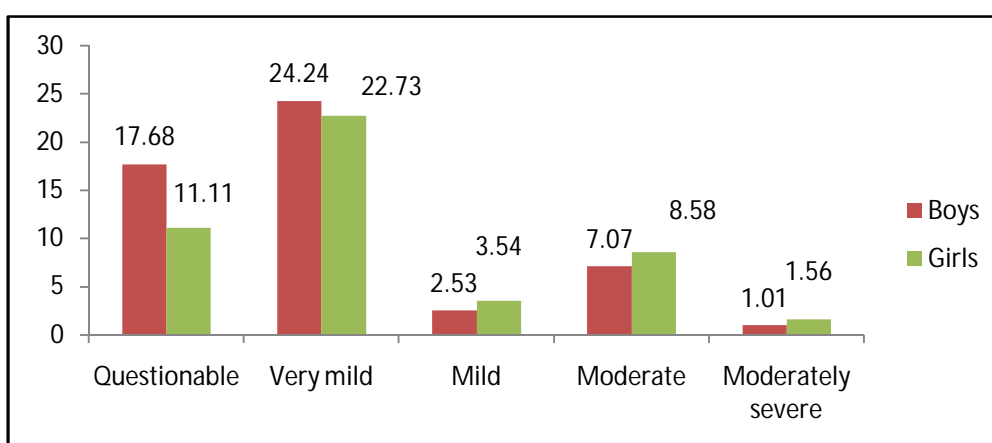


Fig.3. Prevalence of categories of fluorosis in Govt. schools

## V. DISCUSSION

In this study the overall prevalence of dental fluorosis was found to be 22.13%. It is close to findings (31.4%) in rural primary school children of Chidambaram Taluk [19, 20], Tamil Nadu, and close to 36.36% in school children of rural areas of Udaipur Rajasthan [21]. It is also in accordance with work done in Alapuzha district, Kerala [22].

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Vol. 5, Issue 5, May 2016

In government aided schools, the prevalence of questionable fluorosis among boys and girls was found to be 34.61% and 22.02% respectively. It revealed boys were mostly affected by dental fluorosis than girls. Very mild fluorosis was found to be 14.83% among boys and 11.24% among girls respectively. Other three categories of fluorosis were found to be almost equal irrespective of genders.

In government schools also, the prevalence of all categories of fluorosis were found to be same as in the case of government aided schools. But when the categories of fluorosis were compared prevalence was found to be more in government aided schools than government schools.

From the informations collected 99% of the students were from same habitats and hygiene habits. It was also noted that southern part of Sivagiri Taluk is less affected by dental fluorosis since they take drinking water with fluoride (less than 1mg/L) from Kottaimalai. Male students have more fluorosis since they take drinking water from multiple sources with fluoride more than 1.5mg/L.

### VI. CONCLUSION

This study highlight the problems of dental fluorosis among the students of ninth and tenth standard from rural area in Sivagiri taluk, Tirunelveli district where dental fluorosis is a public health problem of 'slight significance'. Severity of dental fluorosis can be overcome by supplying defluorinated drinking water to the affected area and also educating the people to use safe drinking water and take proper food. Proper training camps should be arranged in schools to screen, treat and educate school children, teachers and parents. Further investigations are also needed to find out any other reason and to solve the problem.

### Preliminary Survey Report of Fluorosis (Age group 13 & 14)

**Table – 1 Govt. Aided Schools**

Sl.No	Name of School	Total Surveyed	Boys	Girls	Affected	% of Children affected	Boys	%	Girls	%
1.	NCHSS Ramanathapuram	630	344	286	216	34.29	122	19.36	94	14.92
2.	NCHSS Puliangudi	400	178	222	40	10.00	22	5.5	18	4.5
3.	ST HSS Sivagiri	316	161	155	100	31.65	60	18.99	40	12.66
4.	BV HS. Sivagiri	135	83	52	38	28.15	29	21.48	9	6.66
5.	KHSS Puliangudi (girls)	203	----	203	21	10.34	---	---	21	10.34
6.	ST HSS Puliangudi	129	111	18	30	23.26	26	20.15	4	3.1
		<b>1813</b>	<b>877</b>	<b>936</b>	<b>445</b>	<b>24.54%</b>	<b>259</b>	<b>14.29%</b>	<b>186</b>	<b>10.26%</b>

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**Table – 2 Govt. Schools**

Sl.No	Name of School	Total Surveyed	Boys	Girls	Affected	% of Children affected	Boys	%	Girls	%
1.	GHSS, Vasudevanallur	305	218	87	75	24.59	51	16.72	24	7.87
2.	PK.HSS Mullikulam	63	42	21	11	17.46	10	15.87	1	1.59
3.	MPT HSS Nelkattumseval	219	120	99	65	29.68	35	15.98	30	13.7
4.	GHSS (Girls) Puliangudi	373	----	373	31	8.31	---	----	31	8.31
5.	GHSS Thenmalai	132	71	61	16	12.12	8	6.06	8	6.06
		<b>1092</b>	<b>451</b>	<b>641</b>	<b>198</b>	<b>18.13%</b>	<b>104</b>	<b>9.52%</b>	<b>94</b>	<b>8.61%</b>

**Table – 3 Prevalence of various categories of fluorosis**

**Govt. Aided Schools**

Affected		Questionable	Very Mild	Mild	Moderate	Moderately Severe	Severe
445	<b>Boys</b> 259(58.20%)	154(34.61%)	66(14.83%)	13(2.92%)	19(4.27%)	7(1.57%)	----
	<b>Girls</b> 186(41.80%)	98(22.02%)	50(11.24%)	15(3.37%)	17(3.82%)	6(1.35%)	----

**Govt. Schools**

198	<b>Boys</b> 104(52.23%)	35(17.68%)	48(24.24%)	5(2.53%)	14(7.07%)	2(1.01%)	----
	<b>Girls</b> 94(47.47%)	22(11.11%)	45(22.73%)	7(3.54%)	17(8.58%)	3(1.56%)	----

**REFERENCES**

- [1] Daifullah, A.A.M., Yakout, S.M., Elreefy, S.A., "Adsorption of fluoride in Aqueous solutions using KMnO<sub>4</sub> - Modified activated carbon derived from steam pyrolysis of rice straw". J. Hazard. Mater. Vol. 147, Issue (1-2), pp.633-643, 2007.
- [2] Subramani, T., Elango, I., Damodarasamy, S. R., "Ground water quality and its suitability for drinking and agricultural use in chithar river basin, Tamil Nadu, India". Environ.Geol., Vol. 47, pp. 1099-1110, 2005.
- [3] Ahamed, S. S., Mazumdar, Q. H., Jahan, C. S., Ahamed, C. S., Islam, S., "Hydro chemistry and classification of ground water, Rajshahi city corporation area, Bangladesh". J.Geol.soc.int. Vol. 60, pp. 411- 418, 2002.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

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- [4] Gupta, S., Baneerjee, S., Saha, R., Datta, J.K., Mondal, N., "Fluoride geochemistry of ground water in Birbhum, West Bengal, India". Fluoride, Vol. 39, pp. 318 – 320, 2006.
- [5] Arnesen, A.K.M., Abrahamsen, G., Sandvik, T., "Krogstad, Aluminium–Smelters and Fluoride pollution of soil and soil solution in Norway". Science of the total environment. Vol. 163, pp. 39 - 53, 1995.
- [6] Haron, M.J., Yunus, W.M.Z.W., "Removal of fluoride ion from aqueous solution by a Cerium poly (hydroxamic acid) resin complex. Journal of environ. Sciences health Part A – Toxic / Hazardous Substances". Environmental Engineering. Vol. 36, pp. 727 – 734, 2001.
- [7] Indermitee, E., Saava, A., Karro, E., "Exposure to high drinking water and risk of dental fluorosis in Estonia". Int. J. Environ. Res. public health. Vol. 6, pp. 710-721, 2009.
- [8] Jamode, A.V., Sapkal, U.S., Jamode, V.S., "Adsorption kinetics of defluoridation using low cost adsorbents". J. Adsorption Science and Technology. Vol. 22, Issue (1), pp. 65–73, 2004.
- [9] Veeraputhiran, V., Alagumuthu, G., "A report of fluoride distribution in drinking water". Int. J. Environ. Sci., Vol. 1, Issue (4), pp. 558 – 566, 2010.
- [10] Teotia, S.P.S., Teotia, M., "Endemic fluorosis in India. A Challenging national health problem". Journal of the Association of Physician in India, Vol. 32, pp. 347 – 352, 1984.
- [11] Fernandes, C.M., Tabchoury, C.M., Cury, J.A., "Fluoride Concentration in infant foods and risk of Dental fluorosis (Abs 1505)". J. Dent. Res. Vol. 80. pp. 224, 2001.
- [12] WHO South East Asian Region. Fluoride and Fluorosis jeopardizing your health: A fact Sheet, New Delhi: WHO: 2008.
- [13] Srivastava, A., Singh, A., Yadav, S., Mathur, A., "Endemic dental and skeletal fluorosis: Effects of high ground water fluoride in some north Indian villages". Int.J. oral maxillofacial pathol, Vol. 2, Issue (2), pp. 7 – 12, 2011.
- [14] Sudhir, K.M., Prasanth, G.M., Subha Reddy, V.V., Mohandoss, U., Chandu, G.N., "Prevalence and Severity of dental fluorosis among 13 – 15 year old school children of an area known for endemic fluorosis, Nalgonda district of Andhra Pradesh". Journal of Indian society of Pedodontics and Preventive dentistry, Vol. 27, Issue (4), pp. 192 – 196, 2009.
- [15] Padma K Bhat, Amit Kumar. "Prevalence and Severity of dental fluorosis in an endemically affected district of Karnataka, South India". International Journal of Contemporary dentistry Vol. 2, Issue (2), pp. 96 – 100, 2011.
- [16] Jagan Kumar Basavadoss, Clement Roger, B., Aswath Narayan. "Prevalence and of dental fluorosis and Associated risk factor in 11 – 15 year old school children of Kanyakumari district, Tamilnadu, India. A Cross Sectional Survey". Indian Journal of Dental Research, Vol. 19, Issue (4), pp. 297 – 303, 2008.
- [17] Wond wossan, F., Astrom, A.N., Bjorvatn, K., Bardsen, A., "Sociodemographic and behavioural correlation of severe dental fluorosis". Int.J. Paediatr. Dent. Vol. 16, pp. 95-103, 2006.
- [18] Chandrasekar, J., Anu Radha, K.P., "Prevalence of fluorosis in rural areas of Davangere, India". Int. Dent. J. Vol. 54, pp. 235 – 39, 2004.
- [19] Nanak Chand Rao, Abhishek Mehtha. "Dentition Status and Treatment Needs of 12 year old Rural School children of Panchkula District, Haryana, India". Journal of Indian Dental Association. Vol. 4, Issue (9), pp. 303-305, 2010.
- [20] Saravanan, S., Kalyani, C., Vijayarani, M.P., Jeyakodi, P., Felix, A.J.W., Nagarajan, S., "Prevalence of Dental fluorosis among primary School Children in rural areas of Chidambaram Taluk Kadalur District, Tamil Nadu, India". Indian J Community Med, Vol. 33, Issue (3), pp. 146-150, 2008.
- [21] Dhar, V., Jain, A., Van Dyke, T.A., Kohli, A., "Prevalence of gingival disease, malocclusion and fluorosis in School going Children rural areas of Udaipur District". J Indian Soc Pedod Perv Dent, Vol. 25, Issue (5), pp. 103-105, 2007.
- [22] Gopalakrishnan, P., Vasana, R.S., Sarma, P.S., Ravindran Nair, K.S., Thankappan, K.R., "Prevalence of dental fluorosis and associated risk factors in Alappuzha district, Kerala". National Med. J. India, Vol. 12, pp. 99-103, 1999.