Severity of dental fluorosis in association with socio-economic status among middle school children in Sivagiri taluk, Tirunelveli district, Tamilnadu, India

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Abstract
To estimate the prevalence of dental fluorosis and socio-economic status of middle school children in the study area. A cross sectional survey was carried out on school children of sixth to eighth standard in Sivagiri taluk. Proportion of dental fluorosis was calculated by severity, gender and locality of school children using Dean’s index. Out of 3632 children examined, 969 (26.68%) were affected by dental fluorosis. To identify water sources having fluoride levels beyond permissible limits and formulate guidelines to reduce exploitation of ground water.

Keywords: Dental fluorosis, Severity, Dean’s index, Skeletal, Fluoride and Water

Introduction
Almost three fourth of the earth’s surface is covered by water. But only 0.6% of water is available to us for drinking, domestic and agricultural purposes. Quality drinking water is very essential to human beings and other life forms. Access to safe drinking water has improved over the last decade in almost all parts of the world. But still one billion people lack access to safe drinking water. Drinking water contains many ions. Of these, fluoride is an important one. It has no colour but distinct bitter taste. Fluoride enters naturally into the environment due to the dissolution of sodium fluoride and fluorosilicates, by the anthropogenic activities of human beings and also through effluents from industries [1, 2]. It is present in the environment as fluorite (CaF₂ with small impurities) and fluorides [3]. Nearly 12 million of 18 million tons of fluoride deposits in the earth’s crust is found in India [4, 5]. Fresh water contains 0.01 to 0.3mg/L of fluoride. Sea water contains fluoride in the range of 0.86 to 1.4 mg/L and an average of 1.1mg/L. The main dietary source of fluoride is drinking water. Fluoride in drinking water in India varies from 0.5 to 20mg/L [6]. Fluoride is an essential micronutrient for the health of an individual. Its deficiency leads to dental cavity and excess consumption results in health problems like dental and skeletal fluorosis [7]. Drinking water with more than 6mg/L fluoride results in multi-dimensional health manifestations like dental and skeletal fluorosis [8]. These problems are more acute in rural and urban communities particularly in third world countries [9]. Optimal carioprotective fluoride content in drinking water is approximately 1mg/L in temperate climate. In tropical countries where intake of water is more, desirable fluoride content of drinking water may be 0.5mg/L. The permissible and safe limit of fluoride in drinking water is 1mg/L in India and 1.5mg/L in the U.S. About 50% villages in India have more than 1mg/L fluoride in drinking water [10]. Prevalence of dental caries and dental fluorosis and its relation to fluoride in drinking water have been studied in many parts of India [11-13].

The aim of this study was to assess the prevalence and severity of dental fluorosis in a group of school children in association with their socio-economic status and locality [14] in Sivagiri Taluk, Tirunelveli District, Tamil Nadu in India. Sivagiri Taluk is located at 9.33° N and 77.43°E with the elevation of 165meter. It includes a municipality, three townships and many village panchayats. Sivagiri Taluk has a population of two lakhs with 99,000 males and 1,01,000 females. It has a literacy rate of 67.47%. Most of the students in this area were from educationally and economically backward families.
2. Materials and Methods
Drinking water and ground water samples were collected from 25 locations and tested for various factors including fluoride.
A pilot survey was conducted in Sivagiri taluk of Tirunelveli district pertaining to dental fluorosis. A pre-designed questionnaire was prepared to collect information from the school children. Dental examination was carried out with the help of teachers in broad day 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 carried out between October 2013 and March 2014 among middle school children (age group 10-13) who were studying in five government schools and seven government aided schools. In this survey boys and girls were examined and interviewed.

3. Results
The survey revealed that out of 2774 middle school children studying in government aided schools (boys 1350 and girls 1424), 741 (26.71%) and in government schools (boys 457 and girls 401), 228 (26.57%) were affected by dental fluorosis. The prevalence is more in the northern part of the study area (30-43%) and less in the southern part (<10%). Overall prevalence of dental fluorosis was found to be almost equal in case of govt. aided (26.71%) and govt. schools (26.57%). This is shown in Figure: 1.

![Figure 1: Prevalence of Fluorosis in schools](image)

It was also observed that out of 969 children who were affected by dental fluorosis, 569 were boys (15.67%) and 400 were girls (11.01%). This is shown in Figure: 2

![Figure 2: Prevalence of Fluorosis in endemic area](image)

Of 569 boys, 440 (59.38%) were from govt. aided schools and 129 (56.58%) were from govt. schools. Of 400 girls, 301 (40.62%) were from govt. aided schools, 99 (43.42%) were from government schools (Table - 1).

4. Discussion
In this study the prevalence of dental fluorosis was found to be 26.68%. It is very close to findings (31.4%) in rural primary school children of Chidambaram taluk, Tamil Nadu [18, 19] (fluoride level 3.5 mg/L) and close to (36.36%) in school children of rural areas of Udaipur, Rajasthan [20] (fluoride level 1.5 to 4.0 mg/L) It is also in accordance with work done in Alappuzha District, Kerala [21] (Fluoride level 2.6 mg/L).
Prevalence of dental fluorosis among boys in govt. aided and govt. schools was found to be 15.86% and 15.03% and that of girls was 10.85% and 11.54% respectively. It implied that boys have more prevalence than girls in both the cases.
The trend in questionable fluorosis among boys and girls was 21.05% and 14.57% in govt. aided schools. In govt. schools it was 14.47% and 10.96%. Very mild fluorosis in govt. aided schools among boys and girls was 17.14% and 14.98%.
and in govt. schools 24.56% and 14.91%. In all these cases, the prevalence is more among boys than girls. The same trend was found in other categories also. But mild dental fluorosis was found to be more among girls (12.28%) than boys (9.65%) in government schools. Severe fluorosis was noted in boys only with minimum prevalence (0.54% and 0.88%) in govt. aided and govt. schools. (Table - 2 and 3). From the informations collected 99% of the students have same type of food and hygienic habits. But a part of students (southern) had drinking water from a single source (Kottaimalai) with fluoride level less than 1 mg/L. But students with more prevalence of dental fluorosis had drinking water from multiple sources. (Bore well and Panchayat water) with fluoride level 1.5mg/L.

5. Conclusion
The present study gives us an insight into the problem of dental fluorosis among high school children in a rural area of Sivagiri taluk, Tirunelveli district, where fluorosis is a public health problem of ‘slight significance’. To overcome the severity of dental fluorosis, defluorinated drinking water is to be supplied to the affected area and also to educate the people to use safe sources of water for drinking. Training camps should be arranged in schools to screen, treat and educate school children, Teachers and Parents. Further studies are also needed to find out any other reasons and to solve the problem.

6. References
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