

Study on Interrelationship between DMF Teeth at 12 years of Age and Concentration of Fluoride in Drinking Water Supplies in Different Areas of Dhaka City

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Introduction

From simple observations of enamel disorders with mottled teeth, many investigators reported that there exists association of drinking water supplies with high level of fluoride (1-3). Dean first reported the role of fluoride in the prevention of dental caries (3). Caries experience was expressed by the sum total of overtly carious, filled or extracted permanent teeth per person- DMF (decayed, Missing, filled) or CER (caries, extract restauratio) count. The investigation was limited to children who had been born in the district concerned, had always resided there, and always consumed the local water. In order to check the effect of presence or absence of a drinking water constituent (i.e., a varying concentration of fluoride), it is necessary to select for the survey localities whose water supply had undergone no change, at least during the lifetime of the subjects, but where the fluoride content of the water varied within given limits. The caries experience of children aged 12, 14 years was investigate since children in this age group could still be completely reached in the schools. The prevalence rate of DMF teeth at 12 years of age is reducing in the

industrialized countries, on the otherhand the prevalence is continuing to increase especially in the urban population of developing countries (4). Although considerable attention has been paid to the occurrence of dental caries, high in low fluoride areas, the similar situation have been observed in optimum and high fluoride areas, and numerous aetiological factors apart from fluoride, have been implicated. Since 1930's the inverse relationship between waterborn fluoride and dental caries reduction and the direct relationship between enamel fluorosis and excessive concentrations of water-borne fluoride have been provide by numerous investigations (5-8).

In Bangladesh there is a dearth of information on dental caries status in relation to fluoride concentration of available sources. A study reported that the fluoride concentration of drinking water in the Dhaka city varies Within narrow range (9).

It deserves the investigation on relationship between the fluoride content and dental caries experience among the age group of 12 years which is considered as vulnerable group. Moreover, in the context of health for all by the year 2000, the

WHO global goal for oral health of no more than 3 DMF teeth at 12 years of age that was formulated in 1979 (10). Considering the above facts, it becomes mandatory for determination of fluoride in the main sources and the DMF score in the contained population of Bangladesh.

Materials and Methods

The study was designed to obtain data on degree of dental caries, protection secured from suboptimum, optimum and above optimum levels of fluoride. The study was carried out in Dhaka city where water was supplied by WASA. (Water and Sewarge Authority.)

Section of Study areas

On the basis of difference of distance, four areas were selected for oral health examination in order to evaluate the DMF teeth at 12 years of age. Ten points were chosen for collection of supply water by Dhaka WASA.

Water was collected in a 500ml plastic container. The plastic container was washed and cleaned adequately and rinsed finally with deionised water followed by sample water selected for. All the procedures were carried out in ion-free condition. The sample water was collected prior routine treatment. The sample water was stored in a dark room at room temperature for 24 hours until the laboratory procedures started.

Selection of Study Communities and examination of Dental Condition

The population selection was done during the collection of water in order to find the relation of fluoride taken by the subjects on dental caries. One hundred subjects were examined in each group of four places: (Fig-1). Total number of subjects were four hundred in four areas. The age group was determined at 12-years of age. Dental examination was carried out according to the WHO criteria (11). The examination was performed in ideal working manner and in the environment suitable for detection, and recording (12)

Estimation of fluoride in drinking water

Quantitative determination of fluoride in the drinking water supplies of different points of the Dhaka city was undertaken by using Zirconium-Alizarin method proposed by Megregians because it can be directly applied to many water samples without prior distillation (13).

Apparatus: Perkin Elmer UV/Visible spectrophotometer model 550A was employed for the measurement of absorbance at 525 nm.

Reagents : Analytical grade reagents were used. Double distilled deioned water was used. (a) 0.750 gm of Alizarin Red S was dissolved in one litre of deonised water and used as the colour developing agent. (b). 0.354 gm of Zirconyl Chloride octahydrate ($ZrOCl_2 \cdot 8H_2O$) was dissolved in 700 ml distilled-deionized water to which 33ml, concentrated H_2SO_4 was added

slowly with stirring. 0.1 ml of concentrated HCl was added with stirring the solution. The solution was diluted to one litre and used after one hour. (c)., 0.65 gm of NaAsO₂ was dissolved in 100 ml deionized water. (d). 0.0221 gm NaF was dissolved in 100 ml deionized water and standard fluoride solutions of 0.1, 0.3, 0.5, 0.8 and 1ppm were prepared for standard curve.

procedure : To a 100 ml of water sample of fluoride standard solution dechlorinated with 0.5 ml NaAsO₂ reagent, 5 ml of reagent (a) followed by 5ml of reagent (b) were added and the solution was made well. The absorbance of the sample was recorded after the reaction was preceed for one our ± 2 minutes. The temperature of water sample and that of Fluoride

standard was adjusted to within $2\pm 2^\circ\text{C}$ and all the experiments were carried out at $30\pm 2^\circ\text{C}$. The concentration of fluoride was determined by referring the absorbance reading to a standard curve which had been prepared from standard fluoride solutions and processed as the water sample. A standard curve was prepared each time a fresh batch of reagent (a) or (b) was prepared frequent checks of the curve was performed. The interference by alkalinity such as CaCO₃, Al³⁺, Cl¹⁻, Fe³⁺, Po³⁻/₄ and SO²⁻/₄ common to water samples supposed to produce an error of 0.1 mg/1 of a sample containing 1.0 mg of fluoride.

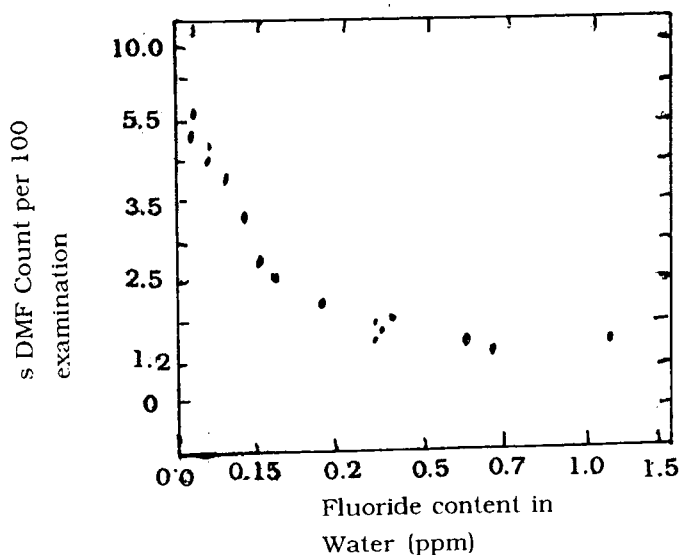
Table 1 Distribution of DMF teeth among the children of four different areas of Dhaka city having different flouride concentration in drinking water.

Area	Fluoride Concentration (ppm)			
	0.15	0.2	0.5	1.5
Eastern	10.5	8.1	3.1	3.1
Western	99.1	7.2	5.2	2.0*
Northern	1.2*	5.3	3.1	2.1
Southern	4.3	4.1	1.2*	1.3*

Total Number of Subjects, 400. DMF teeth per 25 children accounted in each fluoride area.

*P Value=0.001 (Highly Significant). Significant at $P < 0.001$ level from the WHO student of & DMF teeth.

Fig.
Relation between Dental Caries and
Fluoride content of water.



Discussion

The average number of teeth affected by the decay in children at the age of 12 year in four areas of Dhaka city shown in the Table 1, that there is a consistent decrease in the number of affected teeth per child when the fluoride level is high. Average number of DMF teeth per child for children of four different areas plotted different level of fluoride concentration. At the fluoride level of 1.5 ppm, the curves start upward and that continue upward for lower cocentration.

The curve for the lower range become extreamly close from about 1.2 ppm and above, indicating little difference in DMF experience. The plotted curve for the highest concentration of fluoride showing consistently that the influence of fluoride on dental caries

experience is least. The Table 1 shows that the four areas Viz., Eastern Dhaka, Western Dhaka, Northern Dhaka and Southern Dhaka in the metropolis area had different concentration of fluoride. The fluoride was estimated in ten different water sources of WASA, but only four were selected in the study with a view to find relation. Moreover, The four different concentration was allowed in the study (detected known fluoride level) for investigation of caries experience of different grade, indicated by DMF teeth (average). DMF teeth was lowest in northern Dhaka i. e., 1.2 part per million the fluoride concentration was 0.15 ppm, on the otherhand the DMF teeth was relatively high though the flouride level 1.5 ppm. the report from a Southern Dhaka, DMF teeth was 5.1.

Summary

DMF teeth and fluoride concentration showed a close correlation in the present study. The fluoride was estimated by Alizarin-Zirconium spectrophotometric method, and the DMF teeth was recorded according to WHO Basic Oral Health Assessment procedures. The number of DMF teeth is low in the area where fluoride in the drinking water is high ($P < 0.001$). The number of DMF teeth varied from 1.2 to 10.5, in the present study, besides, the fluoride level of drinking water supplies ranges from 0.15 to 1.5 ppm. There is a direct relationship between fluoride concentration and average number of DMF teeth which is inverse in nature.

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