Too Much is too Bad!!

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Introduction

Several studies concluded that drinking water fluoride level up to 1 ppm prevents dental caries, but at higher level leads to fluorosis in the form of dental or skeletal fluorosis.

Case Report

A 18 years old male who resided at Narsana village, District Jalor in Rajasthan, India reported with discoloured teeth, since childhood, which were slowly breaking down, to the Nair Hospital Dental College, Mumbai. No relevant medical history was present. He had history of drinking deep well water and eating food cooked in the same water at the native place Narsana village, District Jalor in Rajasthan where he resided since birth. He reported that other members of the family and also the villagers had similar dental condition. He gave history of eating Gutakha from 7 to 12 years of age. He stopped the habit under the impression that it led to staining of teeth. The extractions of the teeth were done, one week back in Nair Hospital Dental College.

No history of complications, during the dental procedure.

Intra-Oral Examination

All teeth were present except 36,47,18,28. Extrinsic staining present. Generalized intrinsic discolouration of the teeth observed. Teeth showed opaque white colour with brownish hue. Brown small pits were seen merging in the opaque enamel in the occlusal one third of labial or buccal surfaces and in 14,16,17,24,26 on the palatal surfaces and brown discolouration of the occlusal surfaces observed. Generalized attrition of the teeth with fractured palatal cusp of 17 and occlusal cavity in 46 observed.

According to Dean's Fluorosis Index-Modified Criteria (1942) the dental fluorosis was categorized as, Moderate (3.0) - No change in the form of tooth, but generally all of the tooth surfaces are involved. Surfaces subject to attrition are definitely marked. Minute pitting generally on the labial and buccal surfaces present, disfiguring Brown stain is frequently observed.

The patient's 13 year old brother, residing in the same village also presented with the similar dental fluorosis readings, which can be observed in the following photographs.

Treatment

After oral prophylaxis, restorations in 46, 17 followed by full coverage crown on 17.

Composite veneers for anterior maxillary and mandibular teeth and replacement of missing 36 and 47 with fixed partial denture was planned. The use of Domestic Nalgonda Defluoridation Filters in the village was suggested.

Review of Literature

Fluoride level to about 0.7-1.2 ppm, if depending upon temperature of area, is considered to be optimum level of water fluoridation. Mandatory in fluorine - deficient countries like Brazil, Bulgaria, Greece, Ireland and five states of America and countries with enabling legislation are several states of America, Australia, Israel, New Zealand, Canada, and United Kingdom.

Measures of fluoridation

1. Community water fluoridation

It is controlled adjustment of the concentration of fluoride in a communal water supply to about 1 mg of F/liter so as to achieve maximum caries reduction and a clinically insignificant level of fluorosis. The adjustment of water.

2. School water fluoridation

School water fluoridation is a suitable alternative for prevention of dental caries in school age children during school days.

The currently recommended level is 4.5-6.3 ppm of fluoride in the school water supply.

3. Salt fluoridation

250 mg of fluoride per kg salt is found effective in caries prevention.

4. Milk fluoridation

The preventive effect of fluoridated milk is greater, when consumed earlier in life by a child. Systemic and topical both modes of action take place.

Fluorosis[1]

Fluorosis is an endemic disease in geographic areas where the content of fluoride ion in drinking water exceeds 2 ppm. It is chronic fluoride toxicity which results from long term ingestion of small amounts of fluoride.

The commonly recognized effects of fluoride ingestion through fluoridated water at various levels.

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Fluoride level	Fluoride in drinking water	Effect
0.7-1.2 ppm	Depending upon the temperature of the area	Prevents dental caries No dental/skeletal fluorosis
1.5-3.0 ppm	Consumption of water for period of 5-10 years or more.	Milder forms of Dental fluorosis
3.0-8.0 ppm	Consumption of water for a period over 15-20 years	Severe form of dental fluorosis and a milder form of skeletal fluorosis
8.0 ppm or more	Consumption of water for a period of 5-10 years or more	Severe form of dental and skeletal fluorosis

Dental fluorosis

Dental fluorosis is a hypoplasia or hypomineralization of tooth enamel or dentine produced by the chronic ingestion of excessive amounts of fluoride during the period when teeth are developing. Once crowns of teeth are formed, no further fluorosis can be induced by additional intake of fluoride or by post-eruptive topical application of fluoride.

An index for assessment of dental fluorosis was introduced by Trendley H Dean in 1934 known as `Dean's Classification System for Dental Fluorosis' or `Dean's Fluorosis Index.' In 1942 Dean introduced revised version of his fluorosis index, which is still recommended by the World Health Organization (WHO) in its basic survey manual. (W.H.O. 1997).

Skeletal Fluorosis

At water fluoride levels over 8 ppm, skeletal fluorosis may develop. The symptoms may be in the form of severe pain in the back bone, joints, hips or stiffness in joints and spine.

Outward bending of legs, hands, is of advanced stage and these parts loose their shape and contours. This is called knock-knee syndrome. In its severest form, `crippling fluorosis', the spine becomes rigid and the joints stiffen, virtually immobilizing the patient.

Higher levels of fluoride may lead to blocking and calcification of blood vessels causing cardiac problems. It may cause inhibitory effect on enzyme systems. An acute toxic nephritis of kidneys is observed when fatally poisoned by fluoride by accident or intent.

Areas of occurrence

In India, the states having high fluoride levels (endemic fluoride belts with fluoride content in water more than 4.00 ppm) are Punjab, Haryana, Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, Tamilnadu with fluoride content of water raging between 1.1-21.0 ppm.[1]

I personally visited Patan in North Gujarat, India. A dental examination of 15 individuals was done. All the individuals lived form birth or during 1-5 years of age in Patan and had similar level of dental fluorosis. It was around Mild (2) - Moderate (3) according to Dean's Fluorosis Index-Modified Criteria (1942). They used water from ground wells or boring wells. The average fluoride level of water was 6-7 ppm. It was also observed that elderly natives who consumed the same water for the period over 15-20 years had milder form of skeletal fluorosis like pain and stiffness in joints.

Measures of defluoridation[1]

Several methods of defluoridation have been suggested which can be divided into 2 basic types.

1. based upon ion exchange process or adsorption.
2. based upon addition of chemicals to water during treatment

The Nalgonda Technique of defluoridation is extremely useful for domestic as well as for community water supplies.

Conclusion

Fluorides in optimum amount are necessary during pre-eruptive phase and post-eruptive maturation of dentition to prevent dental caries. But chronic excessive fluoride ingestion of more than 1.5 ppm can lead to dental fluorosis up to 5 years of age and skeletal fluorosis when consumed for longer period of time. Accidental ingestion of 2.5-5.0 g of fluoride can be fatal.[1]

(For Colour Figs. Please refer page no. 82)

References

1. Soben Peter. Essentials of Preventive and Community Dentistry: 210-221, 279-371.
2. Murray JJ, Naylor MN. Prevention of Oral Diseases: 3rd edition, 32-62.