



Fluorosis and its relation to Dental Caries:Review

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Abstract:

The aim of this review article is to assess the evidence on the positive and negative effects of fluoride consumption and the relation between fluorosis and dental caries. Fluoride when in normal amount in the air, water and dentifrices can do real good to the teeth in caries prevention. But when it is elevated or if there is over exposure of fluoride it leads to fluorosis. Fluorosis was always said to be preventing dental caries but in the other hand if there is severe fluorosis, there are incidences of multiple caries in the teeth of the same individual. Fluorosis can be prevented by having an adequate knowledge of the fluoride sources, knowing how to manage this issue and therefore, avoid over exposure.

Key words: Fluorine, fluorosis, dental caries, skeletal fluorosis, prevention of fluorosis.

INTRODUCTION:

The most common oral disease seen in children and adolescents is dental caries. In this review, an attempt has been made to bring about the relation between dental caries and dental fluorosis. The upper limit of fluoride concentration in drinking water set by World Health Organisation (WHO) is 1.5mg/l and and The Bureau of Indian Standards has therefore, laid down Indian standards as 1.0 mg/l as maximum permissible limit of fluoride with remarks as “lesser the better” [2]. If an individual consumes more than 1 ppm of fluoride through water, food, air, etc, he gets fluorosis which is a toxic manifestation in the body. There are well documented evidences that excess fluoride intake causes dental fluorosis. [3, 4] Dental caries and its consequences continues to be a public health problem in many low and middle income countries and for socially disadvantaged groups in high income countries. However, the incidence and prevalence of dental caries has decreased significantly over the last few decades, especially in the young, an evident protective effect which can be attributed to the widespread use of fluoride. [5]

FLUORINE :

Fluorine is the most abundant element in nature, and about 96% of fluoride in the human body is found in bones and teeth. Fluorine is essential for the normal mineralisation of bones and formation of dental enamel [6]. Fluorosis is an important public health problem in 24countries, including India, which lies in the geographical fluoride belt that extends from Turkey to China and Japan through Iraq, Iran and Afghanistan [7]. Of the 85 million tons of fluoride deposits on the earth’s crust, 12 million are found in India [8]. Hence it is natural that fluoride contamination is widespread, intensive and alarming in India. Endemic fluorosis is prevalent in India since 1937 [9]. It has been estimated that the total population consuming drinking water containing elevated levels of fluoride is over 66 million [10]. Endemic fluorosis resulting from high fluoride concentration in groundwater is a public health problem in India [11].

FLUORIDATION OF DRINKING WATER

Many studies, abstracts, and editorials are to be found over the years that deal with the process of water fluoridation; that is, the deliberate addition of fluoride compounds to

drinking water in an effort to improve oral health. These studies address the issues of safety and efficacy of this process that is said by its supporters to reduce the incidence of dental caries. The ISFR, officially, takes no stand either for or against fluoridation. As a result, the journal publishes studies from both sides of this scientific and political issue. [1]

DENTAL FLUOROSIS AND DENTAL CARIES :

Dental fluorosis occurs as a result of fluoride exposure during tooth development. Dental fluorosis is visible to the naked eye and has over the years presented a problem in classification. The decline in dental caries prevalence and incidence in developed countries over the last two decades is considered to be largely due to the widespread use of fluoride. Simultaneously, with the decline in caries, an increase in the prevalence of dental fluorosis has been noticed. The increase is in the mild and very mild forms of fluorosis, and is proportionally greater in non-fluoridated areas than in fluoridated areas. This is because of the increase in the mean fluoride intake from all sources since the 1940s. The increase in fluorosis prevalence prompted numerous studies on risk factors for fluorosis. As a result the literature over the last two decades has also reported numerous studies with differing and confusing results. This paper describes for the clinician the condition and summarizes the recent literature on the risk factors for fluorosis. Only well conducted studies evaluating risk factors or indicators and quantifying the risk for dental fluorosis from the 1980s through the1990s time period were included in this review. Four major risk factors were consistently identified: use of fluoridated drinking water, fluoride supplements, fluoride toothpaste, and infant formulas before the age of six years. [12] The incidence of dental caries in 12 year-old children was not associated with fluoridation of the public water supply, as “moderate” and “high” prevalence of this condition was observed in cities without water fluoridation, and “low” and “moderate” prevalence of dental caries was observed in cities with fluoridation. Water fluoridation was associated with fluorosis prevalence. However, fluorosis was also detected in cities without fluoridation, which is possibly due to the ingestion of fluoride from sources other than the public water system. [13]

FLUORIDE ON ENAMEL:

Microscopically, fluoride affects the forming enamel by making it more porous. [14] The degree and extent of the porosity depends on the concentration of fluoride in the tissue fluids during tooth development.[14,15] The structural arrangement of the crystals appears normal, but the width of the inter crystalline spaces is increased, causing pores. With increasing severity of fluorosis, the fluoride concentration throughout the enamel, the depth of enamel involvement, and the degree of porosity of the enamel also increases.[14,16] Clinical studies of dental fluorosis have demonstrated that the most critical period for development of fluorosis is during the post-secretory or early maturation phase of tooth development. [15-20] Since the different teeth are developing at different times, for the whole dentition, this critical period translates to a period from birth to age 8 in a child. For the aesthetically important teeth this period ranges from birth to age six.

PREVENTION OF FLUOROSIS :

Rajasthan and Gujarat in North India and Andhra in South India are worst affected. Punjab, Haryana, Madhya Pradesh and Maharashtra are moderately affected states in India, while the states Tamil Nadu, West Bengal, Uttar Pradesh, Bihar and Assam are mildly affected [21]. Since, the fluorosis is irreversible; its prevention is the appropriate, using various intervention measures. Fluoride poisoning can be prevented or minimised by using alternative water sources, by removing excessive fluoride from drinking water, and by improving the nutritional status of populations at risk. The simple interventions include provision of surface water, rainwater and consumption of Low-fluoride groundwater [22]. Other interventions are de fluoridation of water through flocculation and adsorption. Similarly, health education and better nutrition are the some of the cost-effective intervention measures [22]. To identify the different ways of intake fluoride by children is important to evaluate which sources represent some risk for the development of dental fluorosis. The dentist has to consider the recommendations for professional topical fluoride application, as well as instruct the parents or caregivers in what refers to the age for toothpaste introduction, and the amount and concentration to be used in each age, in order to diminish the prevalence dental fluorosis. [23]

CONCLUSION :

Fluorine is often called as two-edged sword. Prolonged ingestion of fluoride through drinking water in excess of the daily requirement is associated with dental and skeletal Fluorosis. Similarly, inadequate intake of fluoride in drinking water is associated with dental caries [24]. Excess of fluoride consumption leads to mottled enamel which also in turn increases the risk of dental caries. Fluorosis prevalence was high for low levels and low for more severe levels. According to the CFI in the studied example, dental fluorosis represents a public health problem in the studied sample. Dental caries was low with a predominance of tooth decay. [25] we conclude that it is useful to continue using fluoride products, which have proven beneficial in

reducing caries. However, exposure to various fluorides, in addition to the concentration of fluoride in the water and table salt, is a risk factor of dental fluorosis. It is recorded the different grades of dental fluorosis exists and these different grades may be due to amount of fluoride ingested, the period exposure to fluoride, dietary habits. Dental caries is recorded in dental fluorosis in the range of 27.4 to 34.7%. Dental caries prevalence is more as the severity of dental fluorosis increases. In dental fluorosis, fluoride is incorporated and calcium is reduced. Dental fluorosis is hypo-calcified condition which is prone to caries and destruction. [26] Mann et al, have reported statistically significant positive association between caries prevalence and fluorosis, the more severe the fluorosis level, more is the caries rate. [27]

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