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Review Article

Risk factor of Dental Flourosis in Pediatric Patients

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ABSTRACT:
Dental flourosis is considered most prevalent dental disease especially in children. Various causative factors have been established. The present article highlights risk factors of Dental flourosis.
Key words: Children, Dental flourosis, Dental disease.

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INTRODUCTION

There has been a decline in dental caries prevalence and incidence in the developed countries over the last two decades. This decrease is considered to be largely due to the widespread use of fluoride. Concurrent with the decline in caries, an increase in the prevalence of dental fluorosis has been noticed. Concern with the increase in the prevalence has led to numerous studies on reasons for the increase, and in identifying the risk factors for fluorosis. Consequently, the literature has seen a substantial number of studies reported. These studies employing various study designs have used different populations, many with multiple sources of fluoride, and differing indices to measure fluorosis.[1]

Dental fluorosis can be caused by the prolonged and excessive intake of fluorides, and it is a disorder that occurs during odontogenesis. It is defined as the permanent hypomineralization of enamel and is characterized by surface and subsurface porosity. Fluoridated water is a risk factor for fluorosis, although other factors have been noted, including climate and the children's diet. Dental fluorosis varies in degree, it may cause severe changes in tooth colour and often presents

serious aesthetic, organic and functional problems, making it a public health problem with high treatment costs.[2]

"Dental fluorosis," a specific disturbance in tooth formation and an esthetic condition, is defined as a chronic, fluoride-induced condition, in which enamel development is disrupted and the enamel is hypomineralized. Dental fluorosis is a condition in which an excess of fluoride is incorporated in the developing tooth enamel. The occurrence of fluorosis lesions is associated with excessive fluoride intake during the period of tooth development. The most important risk factor in determining fluorosis

occurrence and severity is the total amount of fluoride consumed from all sources during the critical period of tooth development. Fluorosis has a very characteristic appearance in terms of tooth surface appearance and distribution in the mouth.[3]

Microscopically, fluoride affects the forming enamel by making it more porous. The degree and extent of the porosity depends on the concentration of fluoride in the tissue fluids during tooth development. The structural arrangement of the crystals appears normal, but the width of the intercrystalline 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.[4] 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. 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.[5]

Risk factors for fluorosis

The most important risk factor in determining fluorosis occurrence and severity is the total amount of fluoride consumed from all sources during the critical period of tooth development i.e. from birth to 8 years of age. Apart from this most important risk factor there are various other important risk factors which affect prevalence and incidence of fluorosis.[6]

Fluoridated drinking water

Dean, in his early studies recommending fluoridation of water, estimated a 10 percent prevalence of mild or very mild fluorosis in the permanent teeth at water fluoride levels of 1.0 ppm. Reports 10 to 17 years after water fluoridation from the Newburgh-Kingston and Grand Rapids water fluoride studies showed that 7 to 16 percent of the children born and raised in the areas exhibited dental fluorosis.[7] This degree of prevalence was recorded when drinking water was virtually the only potential source of fluoride. In the US, prevalence of fluorosis in the mid-1980s, when fluoride was available from multiple sources, was 22.3 percent in a national sample of schoolchildren.

It becomes the duty of pediatric dentist to give instructions to the parents about the fluoride content in the drinking water and when it is not known, look for this information in the local water supply service. It is crucial for the pediatric dentist to guide the parents in getting the investigation done of the water which child is drinking for its fluoride content.

Fluoride toothpaste

There has been substantial controversy in the literature on fluoride toothpaste's role in causing fluorosis. Most of these studies were designed to find the prevalence or trends in fluorosis in the population of interest, or to find risk factors for fluorosis in populations that had been exposed to multiple sources of systemic fluoride during the period of tooth development. The study designs and methodologies were generally well suited to the individual research question, but were not designed to find an association between early use of fluoride toothpaste and prevalence of fluorosis.[8]

Butler et al[9].73 in their study of 16 Texas communities with varying concentrations of fluoride in the water used Dean's Index, but dichotomized it into two categories. Moderate and severe fluorosis were in one category, and normal, questionable, very mild, and mild fluorosis were in the other category. Defining fluorosis in this manner would reduce the number of disease cases, because children who had very mild and mild fluorosis were categorized as non-diseased. This categorization would tend to show no association between disease and exposure due to misclassification bias. Further, the ages of the study populations in some of the studies were not appropriate to study the research question.

Fluoride supplements

Fluoride supplements are recommended for use in children in fluoride-deficient areas as a caries preventive measure. Numerous studies have shown that supplements are also prescribed to children in fluoridated areas. Many studies identified fluoride supplements as a risk factor for fluorosis. These studies evaluated the role of supplements in fluoridated, nonfluoridated, and both fluoridated and non-fluoridated communities. The odds ratio for fluorosis from use of supplements in the fluoridated areas was as high as 24, while in the non-fluoridated areas where fluoride supplements are routinely recommended the odds ratios ranged from 1.7 to 8. In fluoridated areas, the risk of fluorosis from use of fluoride supplements is much higher, almost four times that in nonfluoridated areas.[10,11]

Fluoride mouthrinses

Fluoride mouthrinses are available as solutions containing either NaF in different concentrations, or acidulated phosphate fluoride (APF). The major apprehension is swallowing of mouthrinses in children who have not yet mastered their swallowing reflex. Hence, fluoride mouthrinses are recommended for use in only those children who reveal the ability to swish and expectorate without swallowing.[12]

Infant formulas

Infant formulas in North America used to contain variable and high concentrations of fluoride, until 1979 when the manufacturers of infant formula voluntarily reduced and controlled the concentration of fluoride in their products. Studies of risk factors for fluorosis involving children who were born before 1979 have shown infant formula to be a risk factor for fluorosis in fluoridated and non-fluoridated

areas with statistically significant risk as high as seven times in the fluoridated areas. However, concern continued that even after the reduction of fluoride content, infant formula was still a potential risk factor, particularly in fluoridated communities.[13]

Richards et al[14] conducted a study to determine the sources of fluoride exposure and the prevalence and severity of fluorosis and sources of fluoride exposure in the permanent dentition of 11-year-old children. A cross sectional study of 111 children attending elementary schools in the State of Mexico, where the concentration of fluoride in drinking water was < 0.3 ppm, was performed using a self-administered questionnaire was directed towards the children' mothers. The level of fluorosis was determined using both the Dean's Modified Index (ID). Children had a fluorosis prevalence of 52.73%. Children who had no fluorosis showed more caries (p = 0.001). Dental fluorosis was associated with the initial age of brushing (before age four), frequency of brushing (three times a day), brushing before sleeping (yes), and applications of fluoride (yes). The level of fluorosis was significantly associated with the amount of fluoride exposure. 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.

Other factors

Other factors or sources of fluoride that have been associated as risk determinants, indicators, or factors for fluorosis are reported. Variables that have been associated with an increased risk of fluorosis are: socio-demographic variables such as the child's age, gender, and race; parent's income and education levels; feeding practices such as weaning before 9 months of age and breast feeding; and fluoride mouthrinse. Children who were male, Caucasian, and whose parents had higher income and educational levels were more likely to have fluorosis.[15]

Table I Different studies

Study	Country	Sample size	P value
Szpunar and Burt[16], 1988	USA	556	0.01
Ismail et al[17], 1990	Canada	936	0.04
Pendrys and Katz[18], 1996	USA	460	0.21
Bagramian et al[19], 1989	USA	916	0.02
Clark et al[20]., 1994	Canada	1131	0.52
Riordan[21] 1993	Australia	350	0.001

Children weaned before 9 months of age or breast fed had a higher risk for fluorosis. Both these indicators are probably surrogates for other variables, therefore not directly causing fluorosis. For example, it is possible that children who were weaned early were then fed infant formulas that were known to have higher fluoride content and so developed fluorosis. Breast milk, on the other hand, is known to contain little fluoride.

Conclusion

Authors suggested that fluoridated water, fluoride supplements, infant formulas, and fluoride toothpastes are risk factors for fluorosis, with increasing risk from the use of any one product as the number of products used by the individual increases. Care should be taken when recommending the use of these products in children below the age of six years. The profession needs to make conscious efforts through education to increase the awareness of it members, and of the medical professionals who prescribe the use of these products to patients.

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