

# PREVENTIVE DENTISTRY

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## Systemic fluoride Effect

### Chronic Fluorosis

#### **Excess fluoride intake and dental fluorosis**

- Infants and toddlers are especially at risk for dental fluorosis of the anterior teeth since it is during the first 3 years of life that the permanent front teeth are the most sensitive to the effects of fluoride.
- Fluoride accumulates at the transition/ maturation stage of tooth development so that the entire tooth surface can be affected. Children fed formula made with fluoridated water are at higher risk to develop dental fluorosis

#### **Clinical Manifestations of Dental Fluorosis**

Clinically, mild cases of dental fluorosis are characterized by a white opaque appearance of the enamel, caused by increased subsurface porosity. The earliest sign is a change in color, showing many thin white horizontal lines running across the surfaces of the teeth, with white opacities at the newly erupted incisal end. The white lines run along the 'perikymata', a term referring to transverse ridges on the surface of the tooth, which correspond to the incremental lines in the enamel known as Striae of Retzius .

At higher levels of fluoride exposure, the white lines in the enamel become more and more defined and thicker. Some patchy cloudy areas and thick opaque bands also appear on the involved teeth. With increased dental fluorosis, the entire tooth can be chalky white and lose transparency .With higher fluoride doses or prolonged exposure, deeper layers of enamel are affected; the enamel becomes less mineralized. Damage to the enamel surface occurs in patients with moderate- to-severe degrees of enamel fluorosis. Teeth can erupt with pits, with additional pitting occurring with posteruptive enamel fracture. In the individuals with moderate dental fluorosis, yellow to light brown staining is observed in the areas of enamel damage. In very severe cases, the enamel is porous, poorly mineralized, stains brown, and contains relatively less mineral and more proteins than sound enamel. Severely

fluorosed enamel can easily chip posteruptively during normal mechanical use . Although teeth with mild dental fluorosis may be more resistant to dental decay because of the higher levels of fluoride contained in the enamel surface,severely fluorosed teeth are more susceptible to decay, most likely because of the uneven surface or loss of the outer protective layer

**Dental fluorosis severity depends on:**

- Stage of tooth development
- Duration of exposure to fluoride
- Concentration of fluoride in foods and drinks. A direct relationship is present between dental fluorosis and level of F ingested.

The central incisor takes approximately 3 years to go through complete enamel mineralization. Timing of chronic daily fluoride ingestion and the corresponding dental fluorosis pattern that can be expected.

<b>Age</b>	<b>Source of excess fluoride</b>	<b>Teeth affected</b>
Birth to 3 years	-Fluoridated tap water used for infant formula	Incisors, first molars
3–6 years	-Early toothpaste use	Premolars, canines, second molars
0–6 years	-General anesthetics -Fluoride supplements – Fluoridated water Any combination of the above plus excess swallowing of fluoridated toothpaste. -Pollution (or drinking water >4 ppm fluoride)	All teeth

The mechanism of the formation of dental fluorosis:

**Pathogenesis of dental fluorosis**

is related to physiological conditions, including body weight, rate of skeletal growth and remodeling, nutrition, and renal function. Bone is a reservoir of fluoride, as fluoride is incorporated in the forming apatite crystals, and this ion can also be

released from these crystals as bone remodels. Therefore, rapid bone growth, as occurs in the growing child, will remove fluoride from the blood stream, possibly reducing the risk of dental fluorosis by lowering serum fluoride levels.

Nutrition is also important for controlling the serum level of fluoride, as ions such as calcium, magnesium and aluminum can reduce the bioavailability of fluoride. A deficiency in these ions in food can also affect (enhance) fluoride uptake. The mechanisms by which fluoride alters enamel maturation are multi- factorial.

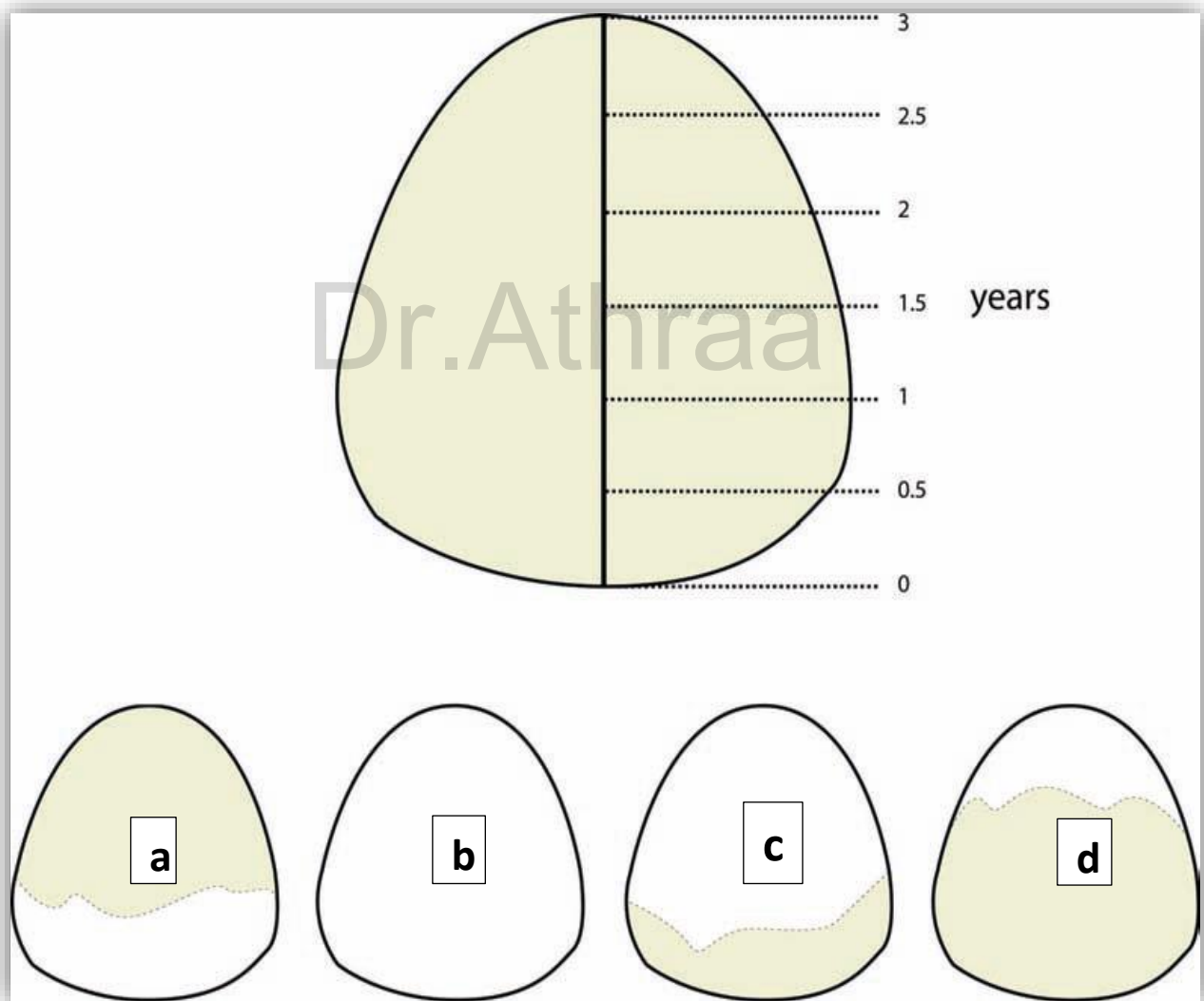
### **Classification of dental fluorosis:**

#### Fluorosis index of H.T. Dean (1942)

<b><u>Score</u></b>	<b><u>Criteria</u></b>
<u>Normal (0)</u>	The enamel represents the usual translucent semivitriform type of structure. The surface is smooth, glossy, and usually of a pale creamy white color
<u>Questionable (0.5)</u>	The enamel discloses slight aberrations from the translucency of normal enamel, ranging from a few white flecks to occasional white spots. This classification is utilized in those instances where a definite diagnosis of the mildest form of fluorosis is not warranted and a classification of 'normal' is not justified.
<u>Very mild (1)</u>	Small opaque, paper white areas scattered irregularly over the tooth but not involving as much as 25% of the tooth surface. Frequently included in this classification are teeth showing no more than about 1–2 mm of white opacity at the tip of the summit of the cusps of the bicuspid or second molars.
<u>Mild (2)</u>	The white opaque areas in the enamel of the teeth are more extensive but do not involve as much as 50% of the tooth.
<u>Moderate (3)</u>	All enamel surfaces of the teeth are affected, and the surfaces subject to attrition show wear. Brown stain is frequently a disfiguring feature.
<u>Severe (4)</u>	Includes teeth formerly classified as 'moderately severe and severe. All enamel surfaces are affected and hypoplasia is so marked that the general form of the tooth may be affected. The major diagnostic sign of this classification is discrete or confluent pitting. Brown stains are widespread and teeth often present a corroded- like appearance.

### Treatment of Dental Fluorosis.

The treatments for fluorotic teeth are limited. For the mildest forms of fluorosis bleaching, to make the color of the tooth surface uniform, can be recommended. Treatments for moderate dental fluorosis include microabrasion, where the outer affected layer of enamel is abraded from the tooth surface in an acidic environment. Composite restorations combined with microabrasion or application of aesthetic veneers can be used for the patients with moderate fluorosis, while for the cases with severe fluorosis, prosthetic crowns may be necessary.



- (a) Exposure during the first year of mineralization may only affect the incisal third of the tooth.
- (b) Exposure to fluoride throughout the entire mineralization period will affect the entire tooth surface.
- (c) Exposure to fluoride in the second and third year of mineralization will leave the incisal third of the tooth unaffected.
- (d) Exposure during the last year of mineralization will affect the cervical third of the tooth surface.

Dental fluorosis in relation to the stage of tooth development and exposure to fluoride. The central incisor takes approximately 3 years to go through complete enamel mineralization .

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