

AN OVERVIEW ON DIAGNOSIS AND MANAGEMENT OF FLUOROSIS: LITERATURE REVIEW

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ABSTRACT

Background: Fluorosis is a cosmetic condition of the teeth that is caused by early exposure to large amounts of fluoride. These sources of fluoride are variable: toothpaste, natural waters, oral fluoride rinsing agents, and brick tea. The prevalence of the disease varies around the world and effort should be made in correctly identify the disease and then provide appropriate management.

Objectives: In this paper, we focus on the condition of dental fluorosis, and only the relevant studies are discussed.

Methodology: The PubMed database was used to select articles, and papers on fluorosis were obtained and reviewed.

Conclusion: In summary, fluorosis is associated with excess fluoride intake during childhood, hence, dentists can provide appropriate oral care, including actively advocating healthy dental care with their patients and increasing awareness of the consequences of early-life fluoride intake. The use of dental indices helps in the early diagnosis and management of this condition.

Key words: Fluoride, dental care, cosmetic condition of the teeth.

Introduction

Fluorosis is a cosmetic condition caused by prolonged exposure of teeth to fluoride that is both preventable and manageable. Chronic exposure to fluoride products will inevitably not only leads to dental, but also skeletal fluorosis. Skeletal fluorosis includes: otosclerosis, osteomalacia, osteoporosis, and degeneration of joints and cartilage tissue¹. This is a problem especially in countries that rely on groundwater resources, such as sub-Saharan Africa². The epidemiological distribution of dental fluorosis is associated with exposure to fluorides. For instance, in Australia, its prevalence and severity have declined during the previous decades as more exposure has been controlled³. In Saudi Arabia, residents who rely on well water were more susceptible to fluorosis—a disease prevalence of 20% in the Southwestern region⁴. While the exact pathophysiology of fluorosis is not well understood, abnormal osteoblasts are potential culprits for the progression of skeletal fluorosis⁵. A dental implant acts as the common dental procedure that is usually undertaken during the cases of jaw or mouth injuries.⁶⁻⁹

Methodology

The PubMed database was used to select the articles and the following keywords were used (“Fluorosis”[Mesh]). According to the inclusion criteria, the articles were selected based on the inclusion of one of the following topics: fluorosis. Exclusion criteria were all other articles which did not have one of these topics as their primary endpoint.

Review

Aetiology

Causes of fluorosis are multifactorial, but the most common and central cause is always a high fluoride intake in the early life. Fluoride is found in many contents, including fluorinated drinks and juices, and most importantly, drinking water. This problem arises when reliance in water comes from natural sources such as groundwater, which may exceed the daily fluoride level recommendations. Children aged 1–8 years old usually intake extra-fluoride from non-traditional sources such as: toothpaste, or oral rinsing agents which contain an ample amount of fluoride¹⁰. For instance, some children develop

a habit of swallowing toothpaste during brushing their teeth. Another cause of fluorosis is the consumption of brick tea during pregnancy ¹¹. In addition, dental fluorosis may be associated with other dental ailments such as dental carries, and teeth trauma ^{12,13}.

Pathogenesis

Dental fluorosis is one of the many diseases currently being investigated, it has a variable pathological causal mechanism, that is not well understood. Current evidence suggests that the pathogenesis of dental fluorosis shows that it is an early manifestation of endemic fluorosis, including effect on the skeletal system. Fluoride interacts with ameloblasts, resulting in the hydrolysis of amelogenin and removal delay ¹. In the same interaction, it can induce apoptosis, which explains the pitting seen in the later stages of dental fluorosis. The pathogenesis of dental fluorosis is moving towards a clearer picture, but current data on specific mechanisms are still lacking ¹.

Clinical Features

Children seldom care about dental health, unless instructed by an educated parent or guardian, or in cases where detrimental effects start appearing. The avid dentist should notice changes in children’s teeth, especially when they start turning from shiny pearly white to paper-like whiteness. Fluorosis changes are a continuum that begins with white spotting, coalescing into opaque patches, and finally pitting ensues in severe untreated cases. Children are often become aware to obvious changes in their teeth’s appearance, but it would not prompt them to seek dental care ¹⁴. The clinical progression of dental fluorosis is well established (Tables 1 and 2).

Moreover, children who ingest toothpaste would present with gastrointestinal symptoms (nausea, vomiting, diarrhoea, and abdominal pain) or at least, have a history of frequent similar symptoms.

	Enamel description	Enamel area affected
Normal	Translucent creamy white	0%
Questionable	White flecks and spotting	≤5%
Very Mild	Scattered paper-like white opaqueness	5–25%
Mild	White opaqueness	25–50%
Moderate		
Severe	Pitting	50–99%

Table 1: Dean’s Index of Dental Fluorosis

Diagnosis

Differentiation of dental fluorosis from similar conditions is a priority in good practice, because this diagnosis is made through clinical inspection (Table 1). Visual inspection should be performed under appropriate settings, including adequate lighting and cleaning dental surfaces ¹⁵. These conditions can be primarily dental, such as: enamel hypoplasia, amelogenesis imperfecta; misdiagnosed dental carries or mechanical traumas. In addition, coeliac disease may be similar in appearance to fluorosis with enamel defects, after which a visit to a medical specialist is required.

Score	Criteria	Corresponding Dean Index
0	Remains the normal translucency of enamel after prolonged drying in air.	Normal
1	Narrow white lines associated with perikymata.	Questionable to Very Mild
2	<i>Smooth surfaces:</i> More pronounced opaque lines that sometimes intersect adjacent lines and follow the perikymata. <i>Occlusal surfaces:</i> Scattered opacity areas <2 mm in diameter and pronounced opacity of cuspal ridges.	Questionable to Very Mild
3	<i>Smooth surfaces:</i> Merging and irregular cloudy opacity areas.. Accentuated perikymata drawing that are often visible between opacities. <i>Occlusal surfaces:</i> marked opacity areas of Confluent. Worn areas look almost normal but are usually limited by the edge of the opaque enamel.	Very Mild to Mild
4	<i>Smooth surfaces:</i> The entire surface Shows marked opacity or appears chalky white. Parts of the surface are less affected by attrition. <i>Occlusal surfaces:</i> The whole surface exhibits marked opacity. Attrition is often pronounced shortly after an eruption.	Mild to Moderate
5	<i>Smooth surfaces and occlusal surfaces:</i> The total surface displays marked opacity with focal loss of the outermost enamel (pits) with a diameter <2 mm.	Severe
6	<i>Smooth surfaces:</i> Pits are regularly arranged in horizontal strips <2 mm along the vertical extension. <i>Occlusal surfaces:</i> The intersection areas with diameter <3 mm exhibit enamel loss. Marked attrition.	Severe
7	<i>Smooth surfaces:</i> Loss of outermost enamel in irregular areas including <1/2 of the total surface. <i>Occlusal</i>	Severe

	<i>surfaces</i> : Morphological changes due to merging pits and marked attrition.	
8	<i>Smooth and occlusal surfaces</i> : Loss of the outermost enamel that contains >1/2 of surface.	Severe
9	<i>Smooth and occlusal surfaces</i> : Loss of the main part of the enamel with a change in the anatomic appearance of surface. The cervical rim of the enamel is often marked almost without effect.	Severe

Table 2: Thylstrup-Fejerskov Index for Dental Fluorosis

Treatment

In most cases, children do not need professional intervention. Certain techniques are used when intervention is necessary, especially in moderate to severe cases. These dental techniques include: teeth whitening, bonding, crowning, veneering, and calcium phosphate paste. Teeth bleaching, or whitening, is reserved for mild cases of fluorosis. As the disease progresses, patients benefit from acid cleansing, known as the enamel microabrasion procedure. Extensive disease in which cavities cover a large portion of the enamel are best managed by composite fillings, veneers, or crown placements.

Prevention

An important part of good dental care, like many diseases in clinical practice, is the focus on disease prevention, not just treatment. Primary prevention of dental fluorosis occurs at the individual and family level. Two methods for achieving prevention of dental fluorosis include: educating the parents about the disease itself and, especially, about the use of toothpaste; and the development of dentifrices with low fluoride content¹⁵. This is not always feasible because many factors play a role in the education process, including maternal education level, family income, and the availability of dentifrices alternatives.

Fluorosis is not the only cause of enamel mottling, but misdiagnosis is frequent and should be considered before measuring fluoride¹⁶. Another method of primary prevention of fluoride depletion in public water is well documented, and should be replicated in areas where there is a significant prevalence of fluorosis^{17, 18}. Reliance on bottled, rather than groundwater, could serve to alleviate some of the fluoride over-intake.

Conclusion

In summary, fluorosis is associated with excess fluoride intake during childhood, so dentists can provide oral care, including actively advocating healthy dental care with their

patients. By doing so, they can raise awareness of the consequences of early-life fluoride intake.

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