

Tooth Color Abnormalities in Children

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Abstract

Both deciduous and permanent teeth can show severe discoloration due to external and internal pigments. Teeth change color over time due to genetic and environmental factors, and spots appear on their surfaces. However, discoloration and stains on the surface of the tooth are different from each other, and this makes their treatment methods also different.

Keywords: *Teeth Discoloration; Stains; Genetic and Environmental Factors*

Introduction

Many parents refuse to see a dentist to check their child's teeth until they see obvious signs of pain and discoloration. This may be because parents often think that dentists may treat the child's teeth with unnecessary restorative treatments, for no apparent reason. There is no doubt that such an idea is completely wrong from the point of view of maintaining the health of the child's teeth because the child's regular visits to the pediatric dentist every six months have been emphasized.

Dental problems, especially dental caries, do not necessarily occur in all children with symptoms such as pain, tooth decay, or even tooth discoloration. On the other hand, the depth of caries, and the degree of involvement of the nervous system may lead to these symptoms. In addition, the pain tolerance threshold in children varies; they may feel pain at one moment, and then not complain of toothache for a long time.

In 1975, Eisenberg and Bernick presented a detailed classification of the causes of tooth discoloration [1]. The most common internal discoloration can be due to pigments of blood origin, drug administration, and hypoplastic and hypocalcified disease conditions. Congenital porphyria, gallbladder defects, anemia, and hemolytic hemolysis reactions can cause tooth discoloration [1]. Newsome and Greenwall [2] looked through the causes of Tetracycline tooth staining and other extrinsic or intrinsic teeth staining problems (Table 1).

Extrinsic factors	Characteristics
Chromogenic bacteria stains	Green, black-brown and orange
Tobacco	Black, brown
Amalgam	Black, grey
Medicaments	Silver-nitrate: Grey black
	Stannous-fluoride: Black brown
	Chlorhexidine: Black brown
Foods and beverages	Coffee, tea, wine, berries etc. Colour of food item
Iron	Black cervical discolouration

Intrinsic factors	Characteristics
Dentinogenesis imperfecta	Yellow or grey-brown
Amelogenesis imperfecta	Yellow brown
Dental fluorosis	Opaque white to yellow-brown patches
Sulphur drugs	Black staining
Tetracyclines	
Chlortetracycline	Grey-brown blue
Oxytetracycline	Brown-yellow to yellow
Tetracycline HCL	Brown-yellow to yellow
Dimethylchlortetracycline	Brown-yellow to yellow
Minocycline	Blue-grey to grey
Doxycycline	No change
Dental trauma	Transiently red through to black
Hyperbilirubinemia	Yellow-green to blue brown and grey
Erythropoietic porphyria	Red or brown
Ochronosis	Brown

Table 1

In the management of patients with discolored teeth, it is very important to know and understand the mechanisms behind tooth discolorations as well as the clinical features of different types of tooth staining so that to make a correct diagnosis.

Here we only mention the change of interior colors due to their evolutionary importance.

Brown, red brown discoloration

This color indicates the consumption of beverages such as coffee, tea, and carbonated beverages. Smoking also causes brown spots on the teeth. A brown tooth surface may indicate that the teeth have been exposed to excessive fluoride as they grow, or it may indicate an inherited disease and food allergy that causes intestinal inflammation, diarrhea, malnutrition, and weight loss. Congenital erythropoietic porphyria (CEP) is also known as Günther's Disease [3]. In these patients, teeth will appear as a green, brown, red-brown, or blue hue by deposition of blood pigment in the enamel and dentin of the developing teeth. The stain may not involve teeth or portions of teeth developing after cessation of hemolysis shortly after birth. Furthermore, ground sections of these teeth will be positive for bilirubin [4].

In other words, the accumulated porphyrin precursors are deposited in bones and teeth. As a result, the dentition can develop a reddish-brown [5,6].

Alkaptonuria and Ochronosis both are autosomal recessive metabolic disorders. Incomplete metabolism of phenylalanine and tyrosine promotes aggregation of homogentisic acid. In these patients, brown discoloration of permanent teeth has been reported [7].

Molar incisor hypomineralization (MIH) is associated with a brown enamel discoloration. Enamel in incisors and first permanent molars are severely hypomineralized. The causing factors such as infections during early childhood, dioxin in breast milk, and genetic factors have been given consideration [8].

Dentine dysplasia type II is an autosomal dominant hereditary disorder that manifests some appearances of DI. Clinically, the teeth have a brown discoloration similar to dentinogenesis imperfecta [9].

In pediatric patients who have Chromogenic bacteria, brown and black tooth discoloration has also been reported [10,11].

Black discoloration

The black tooth stain is a characteristic of extrinsic discoloration in children that is related to a lower frequency of caries, but a few intrinsic factors may be involved.

The predominant microorganisms which are involved in black staining are as follows *Actinomyces*, *Porphyromonas gingivalis*, and *Prevotella melaninogenicus* [12,13].

If one of the child's teeth is darker than the other, it is often due to dental injuries or up-taking certain medications. If the causes of discoloration of a particular tooth are injury and trauma, two conditions can occur. Iron in the blood may have entered the dentinal structures and saturate them, resulting in deep spots inside the tooth. Another condition is that the injury has caused the tooth structure to become out of uniformity mode, and generate more spots accumulating in some areas of the tooth.

On the other hand, when a dental trauma happens, the erythrocytes break down, and the released iron will combine with hydrogen sulfide to form iron sulfide, which has a bluish-black color [14,15].

Iron supplementation during pregnancy and in childhood may also promote black stain development [16,17].

Various materials used for root canal therapy may induce tooth discoloration. As an example, *AH26* can lead to black discoloration in teeth after years [18,19].

Grey discoloration

Gray teeth indicate a previous infection or damage to the tooth [20]. On the other hand, taking some antibiotics such as Tetracycline before the teeth are fully grown, or exposure to metals such as iron or manganese can cause this color. A classic example of internal discoloration results from tetracycline antibiotics. Tetracycline can cause brown or brown-grey tooth pigmentation.

Tetracycline hydrochloride has the highest color changeability among all types of Tetracyclines [21]. With dentin and enamel, it forms a tetracycline-calcium orthophosphate complex [20,21], which is then oxidized by ultraviolet light. The oxidation process leads to pigments that change the texture of the hard tissue. The critical period is the beginning of discoloration of deciduous and permanent teeth, intrauterine development until the age of 8 years. Tetracycline should be avoided, especially during this period [22-24].

The grey discoloration is common in teeth with amalgam restorations in which corrosive amalgam causes pigmentation of dentine by the formation of silver sulfide [25].

Mercury, lead, and silver nitrate salts used in dentistry can cause a grey staining in teeth [26,27].

Yellow, yellow- green, yellow-brown discoloration

Yellow to yellow-brown discoloration has been seen in Amelogenesis Imperfecta and Dentinogenesis Imperfecta which has been observed in children with sickle cell disease [28]. This hereditary condition was featured by various enamel defects such as inadequate deposition of enamel matrix, incomplete maturation of the enamel, and insufficient mineralization of the matrix [29,30].

The yellow-green discoloration was observed in patients with Erythroblastosis Fetalis (a sign of bilirubin in the developing dentitions), Sickle Cell Anemia, and Thalassemia (deposition of blood pigments within the dentinal tubules) [26].

Traumatic injuries to teeth can induce either resorption or a calcifying response. In this phase, after an excessive irregular dentine deposition in the pulp chamber, the color of the tooth crown changes to yellow or yellow-brown [31].

Tetracyclines cause a yellowish or yellow-brown discoloration of teeth in children [20,21]. Some researchers also reported the same appearances after the use of Oxytetracycline and Ciprofloxacin [9,32].

On the other hand, yellow discoloration of teeth is the result of consuming tea, coffee, soft drinks, acidic foods, and smoking. Damaged teeth and lack of some nutrients also cause this type of discoloration.

Excessive exposure to stomach acid causes yellowing of the teeth which is a sign of Bulimia (a type of eating disorder). Teeth can chip easily, and become yellowish, or even have a glassy appearance. Bulimia can also change the shape and length of a child's teeth [33].

The systemic problem with the yellowing of teeth is another issue that causes tooth tissue to turn yellow in general. Children who consume water with high fluoride also develop spotted yellow-brown teeth which are referred to as dental fluorosis [34,35].

Blue, blue-brown discoloration

Patients with dentinogenesis imperfecta (DI) could have a blue-brown discoloration of teeth. DI is a hereditary disorder of dentine that is featured by abnormal dentinogenesis in both primary and permanent teeth [9,10]. This rare type of pigmentation is usually caused by chromogenic bacteria. Bussell observed blue teeth discoloration in a child patient with Wast Syndrome [36].

Minocycline staining is reported as a blue-grey discoloration of the incisal crown of fully erupted teeth [37,38]. In tetracycline users, dark blue dental pigmentation has been observed too [2].

Green, blue-green discoloration

Chromogenic bacteria have been involved in green-stained teeth, which is common in children with poor oral hygiene [11,39].

Green staining of the maxillary anterior teeth has also been caused by *Penicillium* and *Aspergillus*. These microorganisms grow only in bright areas. Hence, anterior teeth are more often involved [26].

Green discoloration of exposed roots of erupted teeth is another pattern of minocycline staining [9].

Green pigmentation in teeth (chlorodontia) may be associated with Hyperbilirubinemia. In this condition, bilirubin is deposited in mineralized tissues like bone and dentine. The primary teeth are affected more frequently than permanent dentitions. The most common causes of hyperbilirubinemia leading to this type are as follows Erythroblastosis Fetalis, premature birth, neonatal respiratory distress, significant internal hemorrhage, congenital hypothyroidism, tyrosinemia, hemolytic anemia, viral infection, and neonatal hepatitis [9,40,41].

Conclusion

Tooth discoloration in children can cause panic in parents. Tooth discoloration is one of the most common cosmetic problems in children. The appearance of yellow, brown, black, or grey colors on the teeth is caused by a variety of reasons, from lifestyle factors to trauma

and damage to the teeth. The appearance of these spots may be due to hereditary and intrinsic causes or due to some external factors on the tooth.

A child's enamel may be genetically weak, which can change the color of teeth and make them more prone to tooth decay. Also, baby teeth in children with jaundice may develop with shades of green. Serious infections and diseases such as neonatal hepatitis and some forms of syndromes can also change the color of a baby's teeth. Taking some medicines in pregnancy or childhood could lead to teeth discoloration.

Because different types of stains and discoloration in children's teeth occur for a variety of reasons, each type of discoloration requires different treatments.

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