

Black Stains: An Update on Etiologies and Treatments

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ABSTRACT

Extrinsic black tooth stain is defined as dark pigmented extrinsic substance in lines or dots parallel to the third cervical line of the tooth crown in the primary and permanent teeth. It is common in pediatric subjects but can also occur in permanent dentition and adults. It is often associated with clinical and aesthetic problems. The mechanisms of black stain formation are not properly understood.

According to the reviewed articles, the prevalence of black stain varies from 2.4% to 18% .It begins as early as age 2 and has an equal sex distribution.

Black stain is hard to be wiped off by daily cleaning via tooth brushing, and tends to recurred after professional hygiene, for this reason can cause an aesthetic problem for the patients.

The aim of this article is to update the knowledge of etiologies of black stains and their treatment. Therefore, clinicians will be able to diagnose the black stains and prevent its recurrence.

Keywords: Black Stains; Extrinsic Discoloration; Pediatric Dentistry; Dental Plaque

Introduction

Tooth discoloration is a common dental finding and associated with clinical and aesthetic problems [1]. It can significantly affect the parents and the child's personality as well as the child's self-confidence [2].

The prevalence of black stains varies from 2.4 to 18%. The different prevalence recorded in different studies could be due to different habitats and lifestyles of different populations, which could be possible etiological factors [3].

Black tooth stain is an extrinsic discoloration which can occur in both primary and permanent dentition, regardless of sex. It is a form of dental plaque characterized by high calcium and phosphate levels in addition to insoluble iron salts [6].

According to [7], it has been defined as: pigmented dark lines parallel to the gingival margin or an incomplete coalescence of dark dots rarely extending beyond the cervical third of the crown. For [10] these stains can also extend over diffuse areas, covering part of the crown.

The black stain is a ferric compound, most likely ferric sulfide, which arises from the interaction between hydrogen sulfide (produced by the bacteria in the periodontal environment) and iron in the saliva or gingival fluid [2,8]. Moreover, another research suggested that, the regular consumption of foods rich in iron and the use of iron supplements during the pregnancy and the early childhood, could favor the development of the chromogenic microbiota [4].

The coloring Black stains is a mild pathology and has no incidence on the vitality of the tooth [9]. Although, they are most of time confused by patients with caries and are caused by anaerobic chromogenic bacteria [3,4,6,9].

Pediatricians periodically examine most of the children during the early years and are frequently asked by their parents about the dental problems of their children. They will, if necessary, refer the child to the pediatric dentist [11].

Recently there have been advancements in the various treatment options in this field. The correct diagnosis for the cause of discoloration is important as, invariably, it has a profound effect on treatment outcomes. However, this discoloration tends to recur [12].

The objective of this article is to update the knowledge of etiologies of black stains and their treatment.

Etiology of black-stained tooth

Over the last century, the etiology of black stains has not been completely understood [1,5].

The etiology falls into two categories. The first category includes compounds that are incorporated into the dental pellicle, which is a salivary glycoprotein and produce a stain, whereas category 2 implicates the chemical interaction between hydrogen sulfide producing micro-flora and iron [2,13].

Besides, chromogenic bacteria are proposed as an etiological factor in the production of black pigments. Periodontal pathogens, such as *Porphyromonas gingivalis*, *Prevotella intermedia* and *Prevotella nigrescens* are reported to be black-pigmented anaerobes in the oral cavity [6].

The microflora of this deposit is dominated by *Actinomyces* having lower cariogenic potential and lower number of *Lactobacillus* spp than non-discolored dental plaque [14], [15], [16].

Unclear etiological factors are associated with the formation of black stains [17]. observed more severe black stains on the lingual surfaces of antero-inferior teeth, where salivary secretion is the most abundant which suggests that saliva plays a role in the development of black stains [15,16,4], consumption of vegetables, fruits, dairy products, eggs and soy sauce may facilitate black stains formation. However, [6] found no relationship between oral hygiene, age of the child, socioeconomic environment and the formation of a chromogenic microbiota.

Tooth discoloration has been frequently associated with medical problems and sometimes due to certain medications or even restorative treatment. Few of the conditions like malnutrition, rubella, measles, and developmental disorders show black stain as one of the manifestation [18]. Another important differential diagnosis is the dental caries. Most of the studies show the occurrence of Black stain with lower caries experience which could imply that caries resistance in children with black stain could be a result of lower caries activity than a localized effect [15,18].

Relationship between black stains and dental caries

The specificity of factors contributing to the formation of black stains and its nature has become of interest as the association between the presence of black stains and lower caries experience in children was noted.

Various epidemiological studies reported that, children with black stained teeth had lower caries prevalence or experiences [14,17]. According to this, a Brazilian study suggested that black stains might be a protective factor for dental caries development [19,20] investigated the association of dental caries and black stains, they showed lower caries experience in patient with black stains. Similarly, a systematic review and meta-analysis, [21] reported that individuals affected by extrinsic black stains have less caries experience compared to those without extrinsic black stains.

Several hypotheses relating to caries development and black stains have been put forward to understand the biological interaction between microbiota related to the extrinsic pigmentation.

According to [7], the presence of more calcium and phosphate in the gingival debris of children with black extrinsic tooth stain could contribute to a reduction in enamel dissolution and an increase in buffering capacity [2,18].

The presence of black stains has been frequently associated with lower caries prevalence [21]. Moreover, many studies suggested that black stain is a protective factor against dental caries development [6,16]. On the other hand, the saliva of children with black stain had significantly higher buffering capacity, higher total calcium, and inorganic phosphate. The chemical composition of saliva could be a factor in children with low susceptibility to caries [22].

It has been deduced that the presence of black stain is associated with a predominance of Actinomyces [23]. Immunological studies and investigations on bacterial adhesion found that high levels of Actinomyces naeslundii in biofilms on teeth correlated with low caries experience and low Streptococcus mutans adhesion [8,10]. This may explain from another perspective why children with black stain had lower caries prevalence compared with those without black stain.

Treatment

The management of extrinsic stains involves proper diet and maintaining oral hygiene; the classic removal of these pigments includes numerous methods such as whitening toothpastes, professional cleaning, polishing and micro-abrasion with abrasives and acids [18]. As it is not possible to remove extrinsic stains by daily tooth brushing, professional cleaning is usually required to meet the child aesthetic demands. Although brushing with pumice powder following simple scaling is usually sufficient, however, the stain tends to re-form within 30 days [24].



The ultrasonic cleaning is not recommended; this modality can lead to enamel removal. As a result, the enamel beneath the stain might be affected, resulting in initial demineralization or roughness [22]. Some extrinsic stains may be removed by rotary polishing with an abrasive prophylactic paste, or air-jet polishing with an abrasive powder [25].

From what can be inferred by the scientific literature, the more effective treatments are lactoferrin, diode laser and laser nd: YAG [24]. According with the study of [26] lactoferrin (LF) and lactoperoxidase

(LPO) are antimicrobial proteins found in saliva, which can promote a shift from a highly diverse and Gram-negative-dominated to a Gram-positive-dominated community in the microbiota of supragingival plaque and tongue coating.

In addition, [27] noted that after the use of laser nd: YAG, after 60 days, the patient at the control has had an important reduction of the black stains.

Another study of [28] reports that by using phototherapy result a reduction in area, color and bacterial colonization of black plaque in adults. According to [24] the use of a phototherapy to remove black stains produced by bacteria without recurrence during a follow-up period of 7 months. [29]. The results showed a significant reduction in Black stain plaque levels after therapy, along with clinical evidence of absence of black pigmentation [24,26].

Another study of [29] showed that black stain formation could be prevented by a new concept: the administration of streptococcus salivarius M18, which is a probiotic applied to help restore a balanced microbiota, thereby improve oral health.

The results show that the assumption of streptococcus salivarius M18 of 3 months significantly reduced the reformation of black stains in children for that period without affecting its manifestation in the successive quarter.

Main emphasis is on the parent education regarding the preventive measures of extrinsic stains in deciduous dentition. Oral hygiene maintenance instructions such as twice daily toothbrushing and flossing must emphasize to their children by the parents. Dental intervention such as professional teeth cleaning or oral prophylaxis comes into the role in case of extrinsic tooth stain [30]. Black stain tends to reform again despite good personal oral care, but quantity may be less when biofilm control procedures are meticulous [31].

Conclusion

Black chromogenic stains are a frequent finding in day to day dental practice. It is different in etiology and composition from other types of stains by the presence of insoluble iron salts and high calcium and phosphate composition.

Black stain is an extrinsic pigmented deposit that is generally observed in primary dentition.

The mechanisms of constitution of these stains are not perfectly understood. In contrast, individuals with this condition seem to present with lower caries prevalence, explained by the presence of different oral bacterial strain in association with this discoloration.

It is essential that health care professionals be familiar with the causes of primary teeth staining and pigmentation. A better knowledge will guide the clinician to a proper diagnosis and facilitate the referral to a specialized pediatric dentist that will provide proper dental care.

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