Prevalence of Black Stains in School Going Children in age Group 6-12 Years

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Abstract

Introduction: Black stains are extrinsic discoloration in primary dentition that can also occur along with dental caries. It clinically presents as pigmented, dark lines or as an incomplete coalescence of dark dots rarely extending beyond the cervical third of the crown. This has often been a concern of dental aesthetics and its frequent recurrence, makes it necessary to find the causative factor and the treatment needed.

Materials and Method: In this cross sectional study, 93 children aged between 6-12years were examined clinically for the presence of black stains using mouth mirror and dental probe by one examiner. The DMFS / deft index were recorded in children with and without black stains.

Results: In the limited sample size recorded, it was observed that 11 children had black stains. Black stains were also found along with dental caries in 3 children. The p value was 0.85373, found to be insignificant

Conclusion: The prevalence rate of black stains is estimated to be 10% from the sample size, as per data collected, Black stains can occur along with caries but the incidence is less. In conclusion , the results of our study , indicates the prevalence of caries along with the black stains in children within the age group 6-12 years , highlight the need to do further investigations

Keywords **:** *Stains, intrinsic , extrinsic, iron , children , black stains, caries*

Introduction

Tooth discoloration can be defined as any change in the color, hue or translucency of a tooth due to a cause. It is an altered physical appearance of the tooth which is a common clinical finding and a concern of aesthetics, found more often among the children thereby having significant effects on their personality and self-confidence. There are several causes of tooth discoloration like food, drinks, poor dental hygiene, and medications [1].

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Tooth discoloration can vary based on their location, etiology, appearance and composition. Historically, tooth discoloration can be classified, based on their location, to extrinsic, intrinsic and internalized [2]. Intrinsic Discoloration refers to the change that occurs due to the disturbance in the structural composition or thickness of the dental hard tissues. It occurs when the tooth structure is penetrated by pigmented materials, usually during tooth development. Extrinsic discoloration refers to the deposit or stain that occurs on the surface of the tooth or in the acquired pellicle. The origin of the stain might be metallic or non-metallic. Internalized discoloration is the presence of an external stain within the tooth following dental development. It is mostly seen in case of any enamel defects and in the porous surface of dental caries. This stain or discoloration can also be an acquired defect due to tooth wear, gingival recession and restorative materials [3, 4].

A common extrinsic discoloration is the black stain which appears as a dark line or an incomplete

coalescence of dark dots formed on the cervical third of the tooth and following the contour of the gingival margin, firmly attached to the tooth surface. It affects mostly the primary dentition and its prevalence seen in both the sexes [5]. Black stain is a form of dental plaque that covers a great surface of the tooth including the grooves, pits and fissures.

According to Ried et.al, the black pigmentation is considered to be an insoluble ferric compound, most likely a ferric sulfide, which arises from the interaction in the saliva or gingival fluid between hydrogen sulfide produced by the bacteria present in the periodontal environment and iron [6]. The microbiological composition of Black stain is hypothesized to be bacterial strains of Acitnomycetes, Lactobacillus and prevotella melaningenica [7].

The origin of Black stain has been discussed for over a century, since 1890. However, the criteria to diagnose the black stain have still not been established. Shourie used the following criteria for classifying black stain: 1) no line 2) incomplete coalescence of pigmented spots and 3) a continuous line formed by the pigmented spots. Further additional classification by Koch et.al, depending on the size of the spots and the presence of cavitation on the tooth surface, and, depending on the area of the tooth surface have also been used in different studies [8].

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 like gametogenesis imperfect show black stain as one of the manifestation. 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 [9].

This study was done to find the prevalence of black stain in school children, aged 6-12 years, among the Chennai population. The children were also asked about their families and their place of residence to help evaluate the risk factors associated with the black stain.

Materials and Method

Sample Selection

A total of 93 children were aged from 6-12 years of age, were examined for black stains from the areas of Old Washermenpet and Perangallthur, Chennai. None of the children had any systemic or infectious diseases and were both physically and mentally well. A written informed consent was obtained from the parents of all the children enrolled in this study. The inclusion criteria and exclusion criteria were as follows;

Inclusion Criteria

- Age group 6-12 years
- Children with black stains

Exclusion Criteria

- Immunocompromised Patients
- Children with any systemic disease
- Enamel hypoplasia

Clinical Examination for Black Stains

The Clinical examination was performed under natural light with plane mouth mirrors and dental probe in the community halls of the respective places. The diagnosis of the black stains was examined based on the criteria given by Shourie and Koch et.al. [8].

A record was maintained for every child with Black stain, where the vestibular and the palatal surface was registered for the maxillary teeth and the vestibular and the lingual surface was registered for the mandibular teeth. In order to record the pigmentation location and extension, every tooth surface illustrated was segmented into three sectors – gingival, middle third and the incisal or occlusal surface.

The DMFS/deft index was recorded in children with and without black stains. The PUFA/pufa index was also recorded to check for any visible pulp, ulceration of oral mucosa, fistula and abscess, if present.

Statistical Analysis

After the examination, the data was processed and a statistical analysis was done using the Social Science Statistics Software for Windows, Version 20.0. Statistical Significance was considered at 5%.

Results

Out of 93 children examined, black stains were

observed in 11 children, 10.23 % of the sample size. 7 children belonged to the age group 6-9 years and 4 of them in the 10 -12 years of age. 82 children did not have any black stains, 76.26% of the sample size. Black stains were found to be more prominent in the lower age group as shown in Table 1

Table 1 - Number of children with Black stains and without

Age group	Black stains (%)	Non - Black stains
6years-12years	7 (6.27)	46 (46.73)
10years-12years	4 (4.73)	36 (35.27)

Dental caries were observed in 3 children black stains. It was observed that in Children without any black stains, dental caries were present in 45 children. (Table 2). The prevalence of caries was found to be insignificant ($p>0.05$)

Table 2 – Prevalence of caries and p value in children with and without black stains

	Black stains	Non - Black Stains	P value
Caries Present	3 (5.68) [1.26]	45 (42.32) [0.17]	0.853
Caries Absent	8 (5.32) [1.35]	37 (39.68) [0.18]	0.853

Discussion

This study was done to estimate the prevalence of black stains in children aged from 6 to 12 years. Additionally, this study helps to show the association between black stains and dental caries in a population based study. Out of 93 children examined, only 11 children were observed with black stains, indicating this type of condition, as a rare disorder, as shown in Table 1. This rare condition observed in this study agrees with other studies which showed similar results [10, 11]. Most of the studies took place in 1970's in different countries. Brazilian studies show a prevalence of 9.3 % of black stains for children aged from 6-13 years of age and 2.5 % for children aged from 3-5 years from different areas of the country [12]. Koch et.al reported a prevalence of 19.9% for school children, aged 7-15 years in Switzerland and 4.6% for children aged 6-10 years in Germany [8]. The different prevalence recorded in different studies could be due to different habitats and lifestyles of different populations, which could be possible etiological factors.

Though etiology behind the formation of black stains still remains unknown, studies show a possible correlation between various risk factors and black stains. Various etiological factors include gender, socioeconomic factors like maternal education, family income, and diet and fluoride level in water consumed. These factors were also commonly associated with the development of caries [13]. With this understanding, Franco et.al found a significant association between black stains and lower income. Children from families with lower income showed a higher prevalence of black stains [14]. Consumption of vegetables, fruits and dairy products also consume black stains development. Certain studies contradict to the fact with the association between sex and black stains prevalence. However, due to insufficient data, the etiology still remains unclear making it difficult to distinguish factors associated with its formation [15, 16].

The association between dental caries and black stains is debatable because of the varying results from different studies. Gallardo et.al stated that there is no association between dental caries and black stains [13]. Contradicting to this, other studies show similar findings demonstrating lower level of caries experience along with black stain Gasparetto et al. Showed a negative correlation between black stains and dental caries, but did not find any association between the presence of black stains and caries prevalence. Similarly, Koch et

al. found a tendency for children with black stains in primary dentition to present less dental caries, but the difference was not statistically significant [8,17] . Other Findings show that both black stains and dental caries had common co-variables, like socioeconomic factors and behavioral which could be reasonable enough to help hypothesize that there could be a possible association [12].

The results of our study suggest that black stains can occur along with dental caries as shown in Table 2. The data revealed that the prevalence of caries in this study was lower among the children with black stains (0.3%) than those of without black stains (36%) ,this finding is in accordance with study done by Gasparetto A et al.10 , Koch et al.8. and Sutcliffe [18] . The mean DMFS values were found to be statistically significant between children with black stains and those without black stains. The mean value of DMFT was 1.5 ± 0.7, which is a bit higher than the mean value observed in another study done in Udaipur for the same age range, which tells us the need for further exploration to find the causative factors responsible [19].

Various hypotheses relating to caries development and black stains have been put forward to understand the biological interaction between microbiota related to the extrinsic pigmentation. Morphological stains reported by Ried et.al and Thaelide et.al confirmed that this kind of stain is a special kind of dental plaque characterized by its flora and its tendency to calcify . The most prominent organisms involved are Actinomyces and Prevotella melaninogenicus. The tendency towards calcification within the black material benefits a high level of calcium and phosphate that gives to a reduction in the enamel dissolution and an increase in the buffering capacity [6, 20]. The saliva of the children with black stains showed a higher content of total calcium, inorganic phosphates, copper, sodium and total protein and less glucose than in controls [21].

With this understanding, and the inverse relationship between dental caries and calculus stated by Duckworth and Hunnigton, Gasperrato et.al proposed that calcium and phosphate are part of the reaction for black stain formation and together with fluoride and pH conditions are the main tooth remineralization components. Because caries development is a demineralization process due to the acids produced by oral bacteria, the presence of a larger amount of minerals in the oral cavity – which could be the case in children with black stains – increases the remineralization process, to keep the oral cavity in a balanced equilibrium and reducing the risk for caries development [12].

Another hypothesis states that low cariogenic oral micro flora is associated with the presence of black stains. The bacteria related to black stains could establish a competitive environment for bacteria related to caries development, impairing the adhesion of these bacteria to dental surfaces or changing the characteristics of the dental biofilm, reducing the potential for caries to develop [22].

The management of extrinsic stains involves proper diet and maintaining oral hygiene. Whitening toothpastes with abrasives help remove extrinsic stains. Other methods include Selective polishing , where polishing is done over a specific tooth using prophylactic angle and rubber cup , with the right toothpaste and use of prophylactic paste , air jet polishing , ultrasonic scaling etc. . However, due to unclear etiology, black stains have a tendency to recur and frequent use of these modalities can lead to enamel removal, which is highly undesirable [23].

In conclusion , the results of our study , indicating the prevalence of caries along with the black stains in children within the age group 6-12 years , highlight the need to do further investigations and statistical analysis with multivariable analysis to help understand the biological mechanism. This in turn will help find a possible solution to help treat this condition.

Ethical Clearance: Department of research , Saveetha Dental College

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Conflict of Interest : Nil

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