

Understanding the Reasons for Tooth Discoloration in Children and Their Management: A Narrative Review

Sandhya J Kadam^{1,*}, Krishna Veni Guttikonda², and Bharat Ram Chowdry Guttikonda²

ABSTRACT

Background: This article aims to study the discoloration of the teeth in pediatric patients in comparison with adults. Staining of teeth can occur at any time, including in utero, during tooth bud formation, due to various reasons. The staining type and intensity determine the damage to the primary teeth and their permanent successors. The primary teeth are the foundation for permanent teeth, which are important for the overall well-being of an individual. Complications of teeth staining may lead to dental and psychological consequences, leading to low self-esteem and feeling less confident at social gatherings and in schools. It may lead to difficulty in eating and speaking. Factors that contribute to staining can be divided into environmental, hereditary, extrinsic, or intrinsic. The health and social habits of mothers during pregnancy may contribute to disturbances in tooth formation and discoloration of teeth.

Methods: This review was done by studying the existing literature using the electronic databases PUBMED/MEDLINE, Google Scholar, and Semantic Scholar.

Results: Articles were found which stated various causes of staining of teeth and plans to prevent and treat the teeth staining.

Conclusion: This article provides an overview of tooth discoloration, its causes, and management plans. It also emphasizes the collaboration of pediatricians and dentists for timely referral and cost-effective management of tooth staining.

Keywords: Extrinsic staining, Fluorosis, intrinsic staining, tooth bleaching.

Submitted: June 08, 2025

Published: August 15, 2025

 10.24018/dent.2025.6.4.392

¹ Department of Pediatrics, Family Health-Care Network, Visalia, California, USA.

² Department of Dentistry, Family Health-Care Network, Visalia, California, USA.

*Corresponding Author:

e-mail: hellosandhya7@gmail.com

1. INTRODUCTION

Extrinsic or Intrinsic are considered as main types of teeth staining. Most of the extrinsic staining is reversible. They can be removed or minimized both in function and aesthetics by practicing good oral hygiene, limiting sugary drinks with water, and regular visits to dentists for recalls and teeth cleaning. Teeth stains or discoloration can occur due to a change in translucency or color of one or multiple teeth [1]. Pigment accumulation on the enamel surface, related to foods and drinks and tobacco smoking, can result in extrinsic stains. Stains occurring within the enamel and dentine are called intrinsic stains. They may develop during the development of teeth, related to dental fluorosis and amelogenesis imperfecta. Intrinsic stains can occur

after the eruption of teeth due to trauma to the pulp, necrosis, and the remnants of the endodontic material. Various techniques and management plans are used to improve the appearance of teeth. Jin *et al.* [1]. have reviewed a case study of a 28-year-old patient in whom a procedure named Internal tooth whitening was used for the central incisor using a bleach technique. The review described the factors contributing to internal tooth whitening, which can be used to improve the appearance of teeth without the loss of additional tooth structure [1].

Intrinsic stains can not be removed from primary teeth. However, determining the etiology and managing the condition will help restore the function and life of primary teeth. As the child grows, primary teeth are replaced with permanent ones. Each stained tooth needs to be assessed



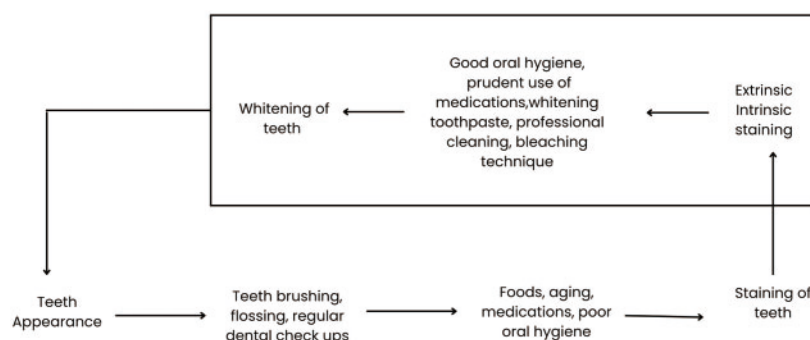


Fig. 1. Graphic abstract for tooth discoloration.

for vitality and esthetics, and timely referral by pediatricians to dentists and the use of advances in science by dentists can help restore both function and esthetics [2]. Abdulfatah *et al.* [2], have reviewed the teeth stains and discoloration. They have classified the stains into intrinsic and extrinsic stains based on their etiology. The review concludes with the importance of knowing the reasons for teeth staining by health care professionals, as better knowledge will guide the clinician to a proper diagnosis and facilitate the referral to a specialized pediatric dentist. The review also reinforces the need to educate children and parents about the maintenance of good oral health [2].

This article highlights the prevention and treatment of teeth staining in pediatric patients.

Please refer to Fig. 1 for the graphic abstract for tooth discoloration.

2. MATERIALS AND METHODS

For the review of this article, electronic PubMed/Medline, Semantic Scholar, and Google Scholar databases were searched to find peer-reviewed articles that addressed the causes and management of staining of teeth in pediatric patients and adults. The keywords used were teeth staining, staining of teeth due to medications, extrinsic staining, intrinsic staining, fluorosis, tetracycline staining, Internal tooth whitening, bleach technique, and iron staining. AND and OR operators were applied to narrow the search. All authors separately conducted the search utilizing the search method. We also found additional articles by looking at the reference lists of the retrieved articles. As a result, a total of 45 articles were identified. The papers were evaluated based on their titles, abstracts, and complete texts, with the primary inclusion criteria being the description of causes and management of staining of teeth in pediatric patients and adults. The most important exclusion criterion was that the article addressed topics other than the causes and management of staining of teeth in pediatric patients and adults. Papers written in other languages were also excluded. The review included 20 articles after the final evaluation to write this review.

3. RESULTS

Please refer to Table I [1]–[19] for a summary of the findings regarding various causes and management options for teeth staining.

It was found that teeth staining is mainly intrinsic and extrinsic, or it can be simply categorized as a range of normal and abnormal teeth colors. Please refer to Fig. 2 for the normal and abnormal colors of teeth.

4. DISCUSSION

The normal teeth color typically appears as a shade of white or slightly off-white, but can vary from person to person. Enamel is primarily responsible for tooth color, which can range from a bluish-white to a yellowish-white hue. Dentin lies beneath the enamel. When enamel thins or becomes less opaque, the yellow color of dentin can become more visible. Some people are naturally predisposed to having whiter or yellower teeth. Lifestyle factors can contribute to tooth coloration. Teeth tend to darken slightly with age as the enamel becomes less opaque and the dentin becomes more visible [3]. Psychological research has confirmed the negative impacts of social judgments related to dental issues, and patients may demand complete whitening of their teeth, which may not be possible. Newton *et al.* [3] studied how tooth colour affected social determination in 50 Caucasian patients subjectively. The study concluded that tooth color influences the appraisals drawn in social situations. In the study findings, whitened teeth were preferred over natural teeth, and the faces with whitened teeth were considered younger. Participants were not happy with their own tooth shade, which drew out more stereotypical behaviour. This study's results may help patients understand what is practically possible to do regarding teeth color treatments [3].

Children present to their pediatricians for all healthcare conditions, including oral health. Based on studies demonstrating limited oral health knowledge and awareness of risk factors for oral health conditions in pediatricians, collaboration between dentists and pediatricians is recommended [4]. Dickson-Swift *et al.* [4] performed a scoping review, which highlighted the widening international interest in involving pediatricians in the oral health management of children. The study findings demonstrated that limited knowledge and understanding of pediatricians in critical areas of dental conditions. The study described

TABLE I: SUMMARY OF THE CAUSES AND MANAGEMENT OF TOOTH DISCOLORATION [1]–[19]

Factors	Causes	Management
Development of teeth	Temporary discoloration as a natural part of the eruption	Proper oral hygiene
Environmental	Secondhand smoke exposure in children, Tobacco and smoking in teenagers and adults	Prevention of exposure Good oral hygiene
Mouth breathing	Dry mouth Plaque buildup and staining	Nasal breathing promotion Hydration Treatment of the cause
Trauma	Bleeding or damage to the pulp	Immediate evaluation Tooth restoration
Genetic	Inherent enamel defects increased susceptibility to staining	Regular dental visits for early detection Cosmetic treatments
Fluorosis	Exposure to excess fluoride during early childhood	Monitor fluoride intake Use fluoride-free toothpaste Cosmetic treatment for permanent teeth
Medications	Tetracycline-induced intrinsic staining	Alternative medicine Oral hygiene
Poor oral hygiene	Insufficient brushing and flossing	Brushing with fluoride toothpaste twice a day Flossing Regular dental checkups
Diet	Colored foods, drinks, Berries, coffee, tea, sugary foods, and acidic drinks	Balanced diet Limit stain-causing foods and drinks Drink water after meals Tooth brushing after eating

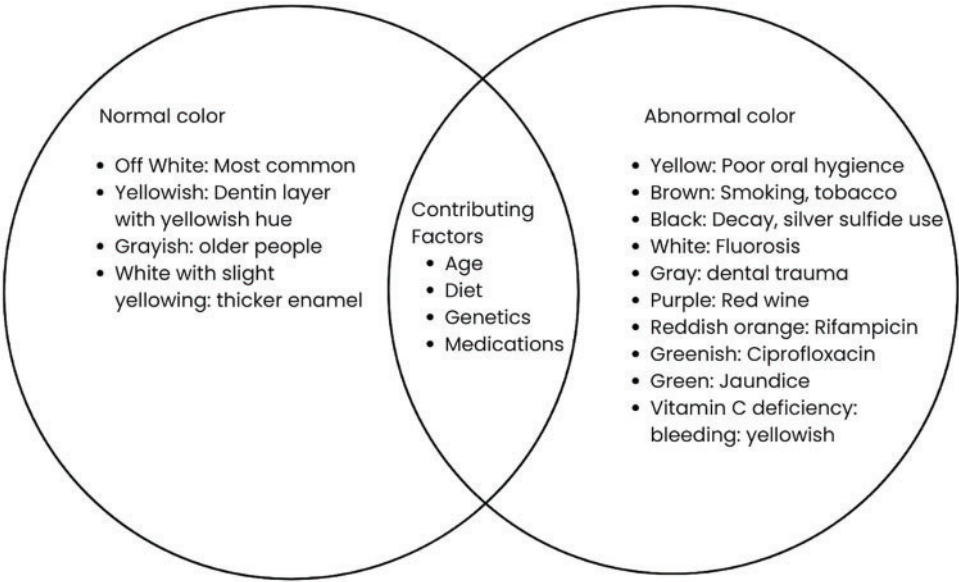


Fig. 2. Normal and abnormal colors of teeth [1]–[19].

barriers for pediatricians, which included a lack of education and training, limited time for appointments, and a lack of referral options. The review offered a starting point for future research to increase the involvement of pediatricians in the oral health of patients. Timely referral by a pediatrician for staining of teeth in pediatric patients can lead to cost-effective dental treatment and help to prevent both physical and psychological complications [4].

4.1. Causes of Tooth Discoloration

Recently, growing interest has been noted in tooth whitening based on the tooth whitening supplies available in the market. Mortazavi *et al.* [5] reviewed that

tooth discoloration can manifest in nine different colors related to various reasons, needing further diagnosis and management. The review stated that the new tooth discoloration classification would help in timely diagnosis and avoid inappropriate treatment measures [5]. Extrinsic stains, such as yellow stains, are usually noticed on primary or permanent teeth during routine examinations. Yellow stains could be caused by poor oral hygiene, unhealthy foods, drinks like coffee or tea, and increased intake of sugars and juices. Leaving the food in the mouth for longer periods of time, especially in picky-eating children, children with special needs, or children who are engaged in excessive screen time while eating, can lead to yellow stains [5].

Some of the medications cause tooth discoloration, especially if prescribed during the antenatal period and in childhood. Black or Brownish stains are noticed on the maxillary anterior teeth in children who take iron supplements (Ferrous). Prolonged bottle feeding, excess intake of milk, decreases iron absorption, and pediatric patients may present with iron deficiency during routine well-child checks with a pediatrician, needing daily iron supplements [6].

Zyla *et al.* [7] Reviewed the literature to study the black stains on the teeth which present as a dark line or dark dots. The review found that the etiology of black stain has been much debated over the last century. They reviewed the articles in which the study was done in pediatric patients. The study found an equal prevalence of black stains in boys and girls, ranging from 2.4% to 18%. The majority of the studies found an association between the presence of black stain and lower caries occurrence. Microflora deposits on the black stains were dominated by *Actinomyces* spp and were found to have lower cariogenic potential as compared to nondiscolored dental plaque. Along with iron, copper, sulfur, and dietary habits, socioeconomic status was correlated with the black staining of teeth [7].

Silver Diamine Fluoride (SDF) is used as a therapeutic interim for caries restoration. It may prevent the progression of decay on primary teeth before permanent restoration. The side effects of SDF are black staining of teeth and discoloration of the gingiva. Worthington *et al.* studied the use of topical silver diamine fluoride (SDF) in dental caries prevention and management. They advised performing additional studies as they could not report the adverse effect of SDF staining effectively [8].

Brownish discoloration of teeth may occur due to dental caries. A characteristic pigmentation is caused by 8% stannous fluoride application. Certain areas of teeth that were previously affected by caries can become discolored. The surfaces most affected are the occlusal surfaces of molars and premolars. Heinrich-Weltzien *et al.* [9] studied the occurrence of caries and microbiota in children with black stain (BS) and non-discolored plaque. The results of the study suggested that the BS composition with different bacteria might be associated with lower caries occurrence. The study advised future studies to find the role of black-pigmented bacteria in periodontitis [9].

Ashe *et al.* [10] reported *Enterobacter* sp. causing blackening of teeth, discoloration, pores, and biofilm formation. They studied teeth blackening and biofilm caused by chromogenic bacteria and their treatment with the herbal approach. Chromogen bacteria-induced stains vary in green shades and are seen most often in the labial surfaces of maxillary anterior teeth in mouth breathers. The study suggested the use of household and herbal products to treat teeth blackening and maintain oral hygiene [10].

Intrinsic stains are more complicated and harder to remove. Discoloration of teeth may occur because of tetracycline deposition used for antibacterial treatment in pregnant women or infants. Since tetracyclines cross the placental barrier, they may affect deciduous teeth. The discoloration depends on dosage, duration of tetracycline intake, and the form of tetracycline. Teeth affected by tetracycline appear discolored as yellow, brown, or greenish,

which is more pronounced at the time of teeth eruption and gradually becomes brownish after exposure to light as tetracycline itself fluoresces. With time, it gradually diminishes. Usually, no treatment is needed. Cosmetic treatment may be offered for permanent maxillary anterior teeth [11]. Warmling *et al.* [11] reviewed 22 articles to study the effects of tetracycline staining on the teeth. The study found that staining of the teeth resulted from its use between 6 months and 6 years of age. The effects of tetracycline on the teeth were related to the activity and staging of tooth mineralization, drug dosage, and duration of treatment. Low-grade tetracycline staining was treated with tooth bleaching, and restorative procedures were advised for severe staining. The article also reported a case of a 48-year-old man who had a history of administration of tetracycline during childhood. They used direct composite resin laminate veneers to get the best results at a lower cost for this patient [11].

Children with cystic fibrosis (CF) are dark colored and could be brown, gray, or yellowish, usually subjected to large amounts of tetracycline and medications taken for flare-ups of cystic fibrosis-related infections during childhood. CF is also associated with a higher risk of development of hypoplastic defects on teeth. Ferrazzano *et al.* [12] studied the occurrence of caries and dental enamel defects in children with CF residing in Italy. The study included 88 patients with CF who were matched with 101 healthy children of the same age [12].

Amelogenesis Imperfecta is a congenital disorder characterized by abnormal enamel formation and abnormal tooth color, such as yellow, brown, or grey teeth. Based on clinical appearance, it is classified into four different types. Children and young adults may seek dental attention to improve the appearance of their teeth. Treatment depends on the severity. No specific treatment is indicated. For cosmetic reasons, bleaching, use of microabrasion, composite resin veneers, or crowns may be used. Patients can present with extrinsic staining following tooth bleaching and microabrasion treatments for tooth discoloration, so it is advised not to eat colored drinks and food for at least 2 days after the treatment [13]. Rogers *et al.* [13] presented a 13-year-old girl with amelogenesis imperfecta who requested treatment for teeth discoloration as the color of the teeth was affecting her social life. She had widespread white opacities for which the microabrasion approach was used with 6.6% hydrochloric acid. The next day, the patient reported that her teeth had turned 'orange'. This extrinsic staining was related to the tomato pizza that the patient had eaten immediately after dental treatment. The tooth discoloration was completely gone with 16% of carbamide peroxide nighttime use. To improve the dental appearance and achieve optimum cosmetic outcomes, the patient was provided with direct composite resin restorations during the follow-up appointment [13].

Red or brownish discoloration may occur in patients with porphyria, a metabolic disorder. Under ultraviolet light, the teeth exhibit red fluorescence. The deposition of porphyrin in the developing teeth and bones indicates that a metabolic disorder may have been present in fetal life [14]. Saikrishna *et al.* [14] presented a 17-year-old male patient who was diagnosed with Congenital erythropoietic

porphyria (CEP). He presented with discharge over the left foot, blisters upon sunlight exposure, extensive mottled pigmentation, excessive facial hair, mutilated fingers, and verrucous growth over the toes. Wood's lamp revealed the Pink fluorescence of teeth [14].

Pigmentation in Erythroblastosis fetalis is manifested in teeth by deposition of blood pigment in the enamel and dentin of the developing teeth, giving them a green, brown, or blue hue. Stain is intrinsic and does not involve portions of the teeth. No treatment is needed as it only appears on primary teeth [15]. Sui *et al.* [15] studied that jaundice in newborns, high levels of bilirubin in the blood, increased hemolysis, and other causes of hyperbilirubinemia can cause the deposition of hemoglobin catabolism products in teeth, causing visibly stained brown/green teeth. They studied the techniques to find the ultrastructure of the dental hard tissues in the case of intrinsically pigmented green teeth. The technique found an ultrastructural variation associated with a pigmentation line in dentine and with a distinct neonatal line in enamel [15].

Decalcification of enamel may occur due to orthodontic treatments where decalcifying agents are used. Decalcification gets worse if it is accompanied by poor oral hygiene. Clinically, it appears as white spots with a chalky structure or line on the facial surfaces near the cervical region of the maxillary anterior teeth. Sanjai *et al.* [16] studied the effects of six different decalcifying agents and their staining properties. Neutral EDTA was found to have the best results as a decalcifying agent [16].

Enamel hypoplasia can be hereditary or environmental. Enamel hypoplasia related to fluoride is called dental fluorosis. Mottling of enamel may occur due to drinking fluoride-containing water during tooth formation. The severity of mottling is directly proportional to the amount of fluoride in the water. Mottled enamel frequently becomes stained an unsightly brown color. For cosmetic reasons, the affected teeth may be bleached with hydrogen peroxide, which may be effective but needs to be performed periodically as the teeth's stain is intrinsic. The option of restoring permanent teeth with Veneers may be considered. Kapadia *et al.* [17] studied causative factors and available treatment options for tooth discoloration. They found that the choice of treatment was chosen based on the cause of the tooth discoloration, and different modalities such as bleaching, use of enamel microabrasion, and crowns can be used [17].

Trauma sustained to either primary or permanent teeth may occasionally result in a change of tooth color to grey, brown, purple, or pink due to underlying inflammation and damage to the pulp tissue. Treatment options may include pulpotomy, endodontic therapy, or tooth extraction, as indicated after clinical evaluation. In some instances, internal resorption following trauma may render the tooth pink [18]. Caeiro-Villasenín *et al.* [18] studied how trauma to primary dentition can alter permanent dentition. The results of the study found that trauma to a primary tooth can affect the bud of the permanent tooth in the form of enamel discoloration and/or enamel hypoplasia. They advised that children with a history of trauma to the primary teeth should follow up with a dentist regularly until they have permanent teeth erupted so that possible

sequelae can be addressed with early diagnosis and management [18]. Please refer to Fig. 2 for the summary of the normal and abnormal tooth colors.

4.2. Tooth Discoloration in Adults

Adults share some of the causes of teeth staining with children. However, causes such as the consumption of coffee, tea, red wine, the use of tobacco, and smoking can be more specific causes in adult patients. Poor oral hygiene and certain foods can cause teeth staining in both children and adults. Old tooth fillings and crowns may cause discoloration in adults. Aging can reveal a yellowish dentin layer to cause discoloration of teeth. Prevention of teeth staining is based on the maintenance of good oral hygiene and the use of available treatment options. Vital bleaching is one of the commonly used treatment options. Bleaching treatment can improve aesthetics, such as appearance, showing teeth while smiling and laughing without feeling ashamed. Bleaching treatment may lead to tooth sensitivity, affecting the quality of life, so providers must discuss the benefits, limitations, and possible side effects of the use of bleaching treatments [19].

5. CONCLUSION

Preventive and therapeutic measures can manage teeth discoloration in pediatric patients. Most of the extrinsic stains are removed by coronal polishing, child prophylaxis, and maintaining good oral hygiene. Most intrinsic staining involves deciduous teeth, for which therapeutic management is recommended. Cosmetic dental procedures can treat intrinsic stains on permanent teeth. Further research to enhance the education, training, and collaboration of pediatricians and dentists may help to determine the type of stain and management. Maintenance of recommended visits with dentists can help prevent and identify tooth discoloration.

5.1. Future Directions

Future directions for the management of tooth discoloration can be based on the reasons for tooth discoloration. Educating and motivating parents of pediatric patients and adult patients about routine oral home care and regular visits to the dentist can help prevent yellow stains. Prophylaxis can be done by performing coronal polishing with a rubber cup, and fluoride pumice can be offered. Manual scaling by removing these superficial stains on the teeth, as well as fluoride application, can also help treat the yellow stains [5].

Iatrogenic tooth discoloration can be avoided by training healthcare professionals who do not advise the use of offender drugs during pregnancy and in young children. In the case of medication, which is absolutely necessary, pediatricians and dentists must instruct the parents about the side effects of medication, such as staining their teeth, and provide tips to avoid staining, such as rinsing with water after taking medications, and take them as prescribed for the shortest duration possible and stop immediately after completion of the course. These stains are temporary and can be removed by good oral hygiene practices at home and teeth cleaning at the dentist's office [6].

Kahler *et al.* [20] reviewed that growing awareness about the appearance of teeth in the general public is increasing the demand for the management of teeth discoloration. Involvement of protocols to prescribe medications and management plans may be helpful to avoid tooth discoloration and achieve an aesthetic result. Low concentrations of Hydrogen peroxide products can be used safely and effectively as an external approach and trays for vital teeth. However, 30-35% of hydrogen peroxide in higher concentrations may lead to external cervical root resorption, so the walking bleach technique with hydrogen-releasing products needs to be used carefully. The use of hydrogen peroxide also needs to follow regulatory guidelines [20].

CONFLICT OF INTEREST

The authors declare no conflict of interest for this article.

REFERENCES

- [1] Jin Y, Paranhos KS, Salamone A, Bongiorno W, Brizuela M. Internal tooth whitening. 2024 May 7. In *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan. PMID: 38753915.
- [2] Abdulfatah A. Primary teeth stains and discoloration: a review. *J Child Sci.* 2021;11(1):e20–7. doi: 10.1055/s-0040-1722276.
- [3] Newton JT, Subramanian SS, Westland S, Gupta AK, Luo W, Joiner A. The impact of tooth colour on the perceptions of age and social judgements. *J Dent.* 2021;112:103771. doi: 10.1016/j.jdent.2021.103771.
- [4] Dickson-Swift V, Kenny A, Gussy M, McCarthy C, Bracksley-O'Grady S. The knowledge and practice of pediatricians in children's oral health: a scoping review. *BMC Oral Health.* 2020 Jul 25;20(1):211. doi: 10.1186/s12903-020-01198-0.
- [5] Mortazavi H, Baharvand M, Khodadoust A. Colours in tooth discolouration: a new classification and literature review. *Int J Clin Dent.* 2014 Jan 1;7(1):17–28.
- [6] Pani SC, Alenazi FM, Alotain AM, Alanazi HD, Alasmari AS. Extrinsic tooth staining potential of high dose and sustained release iron syrups on primary teeth. *BMC Oral Health.* 2015 Aug 4;15:90. doi: 10.1186/s12903-015-0072-0.
- [7] Żyła T, Kawala B, Antoszevska-Smith J, Kawala M. Black stain and dental caries: a review of the literature. *Biomed Res Int.* 2015;2015:469392. doi: 10.1155/2015/469392.
- [8] Worthington HV, Lewis SR, Glenny AM, Huang SS, Innes NP, O'Malley L, *et al.* Topical silver diamine fluoride (SDF) for preventing and managing dental caries in children and adults. *Cochrane Database Syst Rev.* 2024 Nov 7;11(11):CD012718. doi: 10.1002/14651858.CD012718.pub2.
- [9] Heinrich-Weltzien R, Bartsch B, Eick S. Dental caries and microbiota in children with black stain and non-discoloured dental plaque. *Caries Res.* 2014 Dec 5;48(2):118–25. doi: 10.1159/000353469.
- [10] Ashe S, Agasti S, Lakkoji S, Rauta PR, Sahoo H, Mishra M, *et al.* Novel chromogenic bacteria characterized and their probable treatment options using herbal products and reagents to restrict biofilm formation. *J Appl Biomed.* 2017 Nov 1;15(4):291–8. doi: 10.1016/j.jab.2017.08.001.
- [11] Warmling PG, Zanandrea JSA, Goulart TS, Garcia LFR, de Almeida J. Tetracycline staining of the dentition: a review of the literature and report of a clinical case. *Gen Dent.* 2024 May–Jun;72(3):42–8. PMID: 38640005.
- [12] Ferrazzano GF, Sangianantoni G, Cantile T, Amato I, Orlando S, Ingenito A. Dental enamel defects in Italian children with cystic fibrosis: an observational study. *Community Dent Health.* 2012 Mar;29(1):106–9. PMID: 22482260.
- [13] Rogers HJ, Yesudian G, Rodd HD. Unusual extrinsic staining following microabrasion in a girl with amelogenesis imperfecta. *Eur Arch Paediatr Dent.* 2016 Aug;17(4):271–5. doi: 10.1007/s40368-015-0214-8.
- [14] Saikrishna P, Palaniswamy G, Pillikunte Doddareddy N, Ishfaq L, Zargar MN, Wafa Eranhikkal F, *et al.* Congenital erythropoietic porphyria: a rare inherited disorder. *Cureus.* 2024 Mar 5;16(3):e55558. doi: 10.7759/cureus.55558.
- [15] Sui T, Ying S, Korsunsky AM, Landini G. X-ray study of human dental tissues affected by erythroblastosis fetalis. *J Dent Res.* 2015 Jul;94(7):1004–10. doi: 10.1177/0022034515580987.
- [16] Sanjai K, Kumarswamy J, Patil A, Papaiah L, Jayaram S, Krishnan L. Evaluation and comparison of decalcification agents on the human teeth. *J Oral Maxillofac Pathol.* 2012 May 1;16(2):222–7. doi: 10.4103/0973-029X.99070.
- [17] Kapadia Y, Jain V. Tooth staining: a review of etiology and treatment modalities. *Acta Sci Dent Sci.* 2018 Jun 6;2(6):67–70.
- [18] Caeiro-Villasenín L, Serna-Muñoz C, Pérez-Silva A, Vicente-Hernández A, Poza-Pascual A, Ortiz-Ruiz AJ. Developmental dental defects in permanent teeth resulting from trauma in primary dentition: a systematic review. *Int J Environ Res Public Health.* 2022 Jan 10;19(2):754. doi: 10.3390/ijerph19020754.
- [19] Kothari S, Gray AR, Lyons K, Tan XW, Brunton PA. Vital bleaching and oral-health-related quality of life in adults: a systematic review and meta-analysis. *J Dent.* 2019 May;84:22–9. doi: 10.1016/j.jdent.2019.03.007.
- [20] Kahler B. Present status and future directions-Managing discoloured teeth. *Int Endod J.* 2022 Oct;55 Suppl 4(Suppl 4):922–50. doi: 10.1111/iej.13711.