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## Gingival Diseases in Childhood- A Review

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**Abstract-** Children are exposed to various gingival diseases, similar to those found in adults, yet differ in some aspects. These diseases could be plaque or non-plaque induced, familial, or may be associated with a systemic condition. It is crucial to diagnose and manage gingival diseases as early as possible as they have the potential to further progress, causing a severe breakdown of periodontal support. Consequently, the final result may lead to tooth loss at an early age, which in turn will affect the nutrition and overall development of a pediatric patient. Therefore, greater emphasis is given to the prevention, early diagnosis, and treatment of gingival disease in children. As a dentist, it is necessary to be able to distinguish and differentiate all possible gingival conditions to successfully manage them. By establishing excellent oral hygiene habits in children, which will carry over to adulthood, the risk of periodontal disease is lowered. This paper will review various gingival conditions that are found in children, their main clinical features and management.

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# Gingival Diseases in Childhood- A Review

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## I. INTRODUCTION

Periodontal disease may have its origins in childhood. Studies confirm a high prevalence of gingival inflammation in children, which may progress to periodontitis, resulting in the loss of primary and permanent teeth. Therefore, promptly diagnosing and treating gingival diseases in childhood may reduce the risk of carrying forward the disease in adulthood. Gingival diseases affecting children may be broadly classified into Dental Plaque- induced and Non-plaque-induced gingival diseases (table 1).<sup>1</sup>

Table 1 : Gingival Diseases: Classification

| Table1- Gingival Diseases: Classification  |  |
|--|--|
| Dental Plaque-induced Gingival Diseases  | Non-plaque-induced Gingival Diseases   |
| <p><b>A. Gingivitis Associated with Dental Plaque Only</b></p> <p><i>I. Without local contributing factors:</i></p> <ul style="list-style-type: none"> <li>• Chronic gingivitis</li> <li>• Plaque-Induced gingival enlargement</li> </ul> <p><i>II. With local contributing factors:</i></p> <ul style="list-style-type: none"> <li>• Eruption gingivitis</li> <li>• Mouth breathing</li> <li>• Crowding gingivitis</li> <li>• Gingival Changes Related to Orthodontic Appliances</li> </ul> | <p><b>A. Gingival diseases of Viral origin</b></p> <ul style="list-style-type: none"> <li>• Primary Herpetic Gingivostomatitis</li> </ul> <p><b>B. Gingival diseases of Fungal origin</b></p> <ul style="list-style-type: none"> <li>• Acute Candidiasis (Thrush, Candidosis, Moniliasis)</li> <li>• Linear gingival erythema</li> </ul> <p><b>C. Gingival diseases of Bacterial origin</b></p> <ul style="list-style-type: none"> <li>• Acute necrotizing ulcerative gingivitis (ANUG)</li> <li>• Streptococcal infection (Catarrhal gingivitis)</li> </ul> <p><b>D. Congenital gingival Anomalies</b></p> <ul style="list-style-type: none"> <li>• Congenital gum synechia</li> <li>• Congenital epulis</li> </ul> |

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## B. Gingival Diseases Modified by Systemic Factors

### I. Associated with the endocrine system:

- Puberty gingivitis
- Diabetes Mellitus associated gingivitis

### II. Associated with blood dyscrasias:

- Leukemia associated gingivitis
- Others

### III. Associated with nutritional deficiency:

- Ascorbic Acid Deficiency Gingivitis

## C. Modified by medications

### I. Drug-induced gingival enlargement

## E. Traumatic Gingival Lesions

- Factitious gingivitis
- Accidental
- Iatrogenic

## F. Gingival lesions of genetic origin

- Hereditary gingival fibromatosis

## G. Foreign body reaction

- Amalgam tattoo

## H. Gingival manifestations of systemic conditions (rare)

- Pemphigus vulgaris
- Kindler syndrome
- Lichen planus
- Allergic reaction
- Wegener's Granulomatosis

## I. Gingival Abscess

Modified from Armitage GC: Development of a classification system for periodontal diseases and conditions, *Ann Periodontol* 4:1, 1999

Gingiva of children is different in many aspects. Gingiva of the primary dentition generally appears as pale pink, but less pale than that of an adult.<sup>2</sup> The marginal gingiva is also more vascular and contains fewer connective tissue cells.<sup>3</sup> The thinner, more red appearing epithelium with a lesser degree of keratinization may be interpreted as mild inflammation.<sup>3</sup> The width of attached gingiva is less variable in the primary dentition, causing fewer mucogingival problems<sup>3</sup>; however, the width increases with age.<sup>4</sup> Stippling in children usually appears at about 3 years of age without significant inter-arch difference.<sup>5</sup> Interdental papilla is broad bucco-lingually and narrow mesio-distally.<sup>6</sup> The junctional epithelium tends to be thicker of the primary dentition than the permanent.<sup>7</sup> Gingival sulcular depth ranges from 1-2 mm which is shallower than that found in adults.<sup>8</sup>

There are normal physiological changes associated with tooth eruption that may appear as gingival pathology and must be distinguished. The gingival prominence caused by the crown of an underlying erupting tooth is firm and pink, with mild inflammation from mastication; however an eruption cyst will present as a bluish or deep red enlargement of the gingiva over the erupting tooth<sup>6</sup>. The gingival margin of a newly erupted tooth appears rounded, edematous and reddened and may mimic gingivitis. This paper will present various dental plaque and non-plaque induced gingival diseases affecting children and adolescents.

## II. DENTAL PLAQUE-INDUCED GINGIVAL DISEASES

Chronic gingivitis is common in children and adolescents, where inflammation is generally limited to the marginal gingiva with undetectable loss of bone or connective tissue attachment<sup>6</sup>. The primary cause is dental plaque related to poor oral hygiene.<sup>6</sup> Clinical features include red linear inflammation, increased vascularization, swelling, and hyperplasia<sup>9</sup>. Bleeding and increased pocket depth are found less frequently in children than in adults, but may be observed in severe gingival hypertrophy or hyperplasia.<sup>9</sup> Calculus deposits are rarely seen in infants but may increase with age<sup>6</sup>; however, children with cystic fibrosis have higher incidences of calculus, which may be caused by increased salivary calcium and phosphate concentrations<sup>10</sup>.

Plaque control procedures<sup>11</sup> in the primary dentition can be accomplished by rubber-cup coronal polishing (if no calculus is evident) or by selective supra-gingival scaling (if calculus is evident); however as permanent teeth erupt, addition targeted sub-gingival scaling may also be necessary. Oral hygiene measures should be instructed to parents and children in terms that both understand. The dynamic process of developing manual dexterity impacts the ability of a child to perform expected procedures. Children are encouraged to use a simple scrub technique; more

refined brushing techniques can be introduced during adolescence. Flossing should be added to the home care routine as interdental contacts develop, and is usually not indicated in the primary dentition stage. Antimicrobial mouth rinses for chemical plaque control are not indicated in very young children because of the risk of ingestion.

Plaque induced gingival enlargement occurs due to prolonged plaque exposure which may be complicated by local factors like mouth breathing, or orthodontic appliances.<sup>12</sup> Clinically, it ranges from pale and fibrotic to red and friable.<sup>12</sup> There is localized or generalized enlargement of the interdental papilla and/or gingival margin.<sup>12</sup> Meticulous plaque control is required, and sometimes, gingivectomy or gingivoplasty may be indicated.<sup>12</sup>

Eruption gingivitis is a temporary type of gingivitis seen in young children during teeth eruption.<sup>13</sup> Tooth eruption itself does not cause gingivitis; in fact it is the inflammation associated with plaque accumulation around erupting teeth is common.<sup>7</sup> Eruption gingivitis is usually mild which requires no treatment other than improved oral hygiene.<sup>13</sup>

Mouth breathing and lip incompetence may result in increased plaque and gingival inflammation which is often limited to the gingiva of the maxillary incisors due to frequent drying out of the gingiva.<sup>11, 14</sup> Treating the cause of mouth-breathing may resolve the problem for example gingivitis secondary to mouth breathing caused by allergic rhinitis can be treated by antihistamines<sup>6</sup> and incompetent lips can be corrected by orthodontic treatment.

Crowding gingivitis due to irregular arrangement of the dentition, preventing self-cleansing of the mouth. It is worse in children who do not brush their teeth regularly. Oral hygiene instructions and orthodontic treatment can alleviate the gingivitis.<sup>11</sup>

Gingival changes due to orthodontic appliances can occur within 1 to 2 months of appliance placement due to difficult plaque removal.<sup>11</sup> Changes are generally transient, rarely producing long-term damage to periodontal tissues.<sup>11</sup> Use of special toothbrushes (e.g. powered tooth brushes) and additional cleaning tools may be recommended for better plaque control.<sup>15</sup>

Pubertal gingivitis peaks at 9 to 14 years of age and generally subsides after puberty.<sup>7</sup> Hormonal changes during puberty accentuate the vascular and inflammatory response to dental plaque<sup>9</sup> and also alters reactions of plaque-microbes<sup>16</sup> that could explain this modified gingival response. Frequently, it presents as enlargement, bleeding and inflammation in interproximal areas without concomitant increase in plaque levels affecting both males and females.<sup>17</sup> It generally subsides after puberty however severe cases are treated by improving oral hygiene<sup>13</sup>, removing all local irritants<sup>13</sup>, restoration of carious teeth<sup>13</sup> and improving nutritional status (e.g. administration of 500mg of ascorbic acid orally for 4 weeks<sup>19</sup>).

Diabetes mellitus Type 1 occurs more frequently in children and adolescents than Type 2. Gingival inflammation and periodontitis are more prevalent and severe in affected children with poor metabolic control than in unaffected individuals.<sup>20</sup> Premature tooth loss and impaired immune response to oral flora occurs in severe cases. Treatment includes- controlling diabetes, disease prevention<sup>21</sup> and early training and motivation of children to maintain efficient plaque control<sup>21, 22</sup>.

Leukemia is the most common type of cancer in children, and acute lymphoblastic leukemia is the commonest amongst them. It is accompanied by oral symptoms that include acute gingival enlargement, ulceration, bleeding and infection.<sup>23</sup> These patients have low tissue-resistance to infection, owing to decreased circulating leukocyte count, which is further complicated by cytotoxic drugs (interfere with epithelial cell replication) that are used in the treatment of leukemia. Therefore, rigorous plaque control measures must be implicated both before commencing cytotoxic treatment and during medical treatment.<sup>22,24</sup>

Gingivitis associated with vitamin C deficiency can lead to edematous and spongy gingiva, spontaneous bleeding, and impaired wound healing.<sup>12</sup> The underlying deficiency must be corrected, along with plaque control.<sup>12</sup>

Drug-induced gingival enlargement can occur in children taking anticonvulsants (phenytoin,<sup>25,26</sup> valproate<sup>26</sup>), calcium channel blockers (nifedipine<sup>26</sup>, diltiazem<sup>26</sup>, verapamil<sup>26</sup>), and immunosuppressives (cyclosporine A<sup>27</sup>). Although complicated by increased plaque along the gingival margin, the features of this condition differ from that of chronic marginal gingivitis.<sup>9</sup> The clinical features are very similar irrespective of the drug involved. The first signs of change usually appear 3 to 4 months after drug administration. Enlargement appears mulberry-shaped, pink, firm and stippled in patients with good hygiene, however, in subjects with pre-existing gingivitis, or a poor standard of plaque control, the enlarged tissues show classical signs of gingivitis.<sup>3</sup> To manage such enlargement, strict oral hygiene instructions and scaling must be implemented.<sup>3</sup> Severe cases inevitably need to be surgically excised and re-contoured (gingivectomy and flap surgery).<sup>3</sup> A follow-up program is essential to monitor plaque control and to detect any recurrence, in which case drug modification may be needed.<sup>3</sup>

### III. NON-PLAQUE INDUCED GINGIVAL DISEASES

Primary herpetic gingivostomatitis is an acute infectious disease of the gingiva caused by herpes simplex viruses (HSV) Type-1 most commonly affecting children between 2-5 years of age.<sup>28</sup> Clinical features include febrile illness, headache, malaise, oral pain, mild dysphagia, and cervical lymphadenopathy.<sup>3,9,13,28,29</sup> Gingivitis is the most striking feature, with markedly swollen, erythematous, friable gums.<sup>3,13,29</sup> The

goal of treatment is to make the patient comfortable, and to prevent secondary infections or worsening systemic illness. Supportive management involves bed rest, eating a soft diet, and maintaining adequate hydration and treating pyrexia using paracetamol suspension.<sup>3,29</sup> Secondary infection of ulcers is prevented using chlorhexidine.<sup>3</sup> Systemic treatment includes antivirals (acyclovir) and analgesics (acetaminophen). Topical anesthetics may also be used; however, do not speed healing.<sup>3,13,29</sup>

Candidiasis caused by *Candida albicans* following a course of antibiotics or as a result of congenital or acquired immunodeficiencies. In neonates, infection can be contracted during passage through vagina. It is less common in children and is rarely associated with a healthy child.<sup>30</sup> It presents as raised, furry, white patches, which if removed leaves bleeding underlying surface.<sup>13</sup> Infants can be treated topically by a suspension of 1mL (100,000 U) of nystatin 4 times a day. Older children can be treated using clotrimazole troches or nystatin pastilles. Severe cases can be managed by systemic fluconazole (infants-suspension 6mg/kg or less per day; older children- 100mg tablet for 14 days).<sup>13</sup> Catarrhal gingivitis (streptococcal gingivitis) is caused by hemolytic streptococcus. Clinical features include fever, headache, myalgia, and arthralgia<sup>31</sup>. The gingiva is painful, appears red, soft and friable, and tend to bleed spontaneously. Improved oral hygiene, mouthwashes and antibiotics are recommended for treatment.<sup>31</sup>

Acute necrotizing ulcerative gingivitis (ANUG) is a broad anaerobic infection caused by fusiform bacteria, spirochetes, and other gram-negative anaerobic organisms.<sup>3,29,32</sup> Malnutrition, stress, lack of sleep are few predisposing factors.<sup>29,32</sup> It is common in young children in less-developed countries. ANUG is rapid in onset and very painful. "Punched out" ulceration and necrosis occur in the interdental papillae and marginal gingival, covered by yellowish-grey pseudo-membranous slough.<sup>3</sup> Eventually, involve the alveolar crest and may progress to necrotizing ulcerative periodontitis in immuno-compromised individuals as recurrence is inevitable. Treatment include intense oral hygiene, professional plaque removal, mouthwash rinse (0.5% hydrogen peroxide -removal of necrotic tissues and 0.2% chlorhexidine- prevents plaque formation), antibiotics (penicillin or metronidazole), and NSAIDs for pain.<sup>33</sup>

Congenital epulis a rare gingival tumor that occurs along the alveolar ridge in newborns, without additional congenital malformations or associated teeth abnormalities. Clinically presents as a smooth, well-defined erythematous mass arising from gum pad. Small lesions may regress and larger lesions must be resected, as they often interfere with airway and cause feeding difficulties. The un-erupted teeth are not affected usually.<sup>34</sup>

Congenital gum synechia presents as unilateral or bilateral adhesions between the maxilla and mandible in the form of fibrous bands that makes feeding, swallowing and respiration difficult soon after birth. Early treatment is recommended which involves excision of alveolar bands. If not treated, it may result in TMJ ankylosis, restricted jaw growth and overall growth may also be affected (restricted feeding).

Traumatic lesions can be factitious, iatrogenic or accidental and can occur as a result of chemical physical or thermal injury.<sup>37</sup> Toothbrush abrasion due to faulty brushing technique is very common which presents as painful ulceration with surrounding erythematous halo. These may usually get superinfected by normal mixed flora of oral cavity when these ulcers may get covered with yellowish exudates.<sup>33</sup> Initial professional cleaning followed by cessation of tooth-brushing for 7-10 days is recommended, during which child should rinse 2 times daily with 0.1% chlorhexidine.<sup>33</sup> The right brushing technique must also be taught to the child.

Factitious gingivitis (Gingivitis artefacta) is a self-inflicting physical injury of gingiva that could be habitual, accidental or psychological in origin.<sup>3, 38</sup> The minor form is caused by rubbing or picking of the gingival with fingernail or abrasive foods while, the major form is more severe and widespread, involving deeper periodontal tissues.<sup>3</sup> Other areas of the mouth may be involved, as well as extra-oral injuries found on the scalp, face or limbs. Management includes removal of irritation source, habit correction, and wound dressings.<sup>3,38</sup> In major cases, psychological or psychiatric consultation may be advised.<sup>3,38</sup> Hereditary gingival fibromatosis is a rare overgrowth usually transmitted as dominant trait<sup>40</sup>. Enlarged gingival tissues are usually normal, pink, firm and leathery with little inflammation and involves attached, interdental and marginal gingiva.<sup>39,40,41</sup> There may be esthetic or functional problems, such as mal-positioning of teeth, prolonged retention of primary teeth and delayed eruption of permanent successors.<sup>41</sup> In addition, the hyperplastic region produces conditions favorable for accumulation of dental plaque causing secondary-inflammatory changes.<sup>41</sup> Treatment include removal of hyperplastic tissues by conventional gingivectomy.<sup>42</sup>

Strawberry gingivitis gingival manifestation of Wegener's Granulomatosis, a necrotizing granulomatous vasculitis affecting upper and lower respiratory tract and kidney<sup>44</sup> which may also affect pediatric age group<sup>45</sup>. Oral manifestations include the gingiva exhibiting erythema and enlargement, typically described as "strawberry gums".<sup>43,46</sup> Treatment include administration of immunosuppressives like prednisolone and cyclophosphamide<sup>43, 44</sup> for which child patient must be referred without delay for medical evaluation and management<sup>43</sup>.

Kindler syndrome is an autosomal recessive disorder<sup>47</sup> that may present with oral lesions that are clinically consistent with desquamative gingivitis, along with Cutaneous neonatal bullae, poikiloderma, photosensitivity, and acral atrophy.<sup>48</sup> Traditional non-surgical periodontal treatment can be beneficial for treating gingival manifestations.<sup>47</sup>

Pericoronitis inflammation of gingival covering partially erupted tooth (most commonly third molars).<sup>12</sup> Food entrapment creates an ideal environment for bacterial growth leading the pericoronal flap to become inflamed and swollen.<sup>12</sup> The enlarged flap, traumatized by occlusion, is very painful. Debridement, chlorhexidine irrigation and antibiotics are used for management.<sup>12</sup>

Gingival abscess is an acute, localized, painful lesion of marginal gingiva or interdental papilla, caused by an embedded foreign object.<sup>12</sup> Treatment is done by debridement, drainage and chlorhexidine irrigation.<sup>12</sup>

#### IV. CONCLUSION

To summarize, the differences in the causation and pathogenesis of gingival diseases in children are as varied as their adult counterpart with similar clinical presentations of gingival bleeding, pain and swelling. Nevertheless the importance of recognizing these gingival manifestations in childhood can give a clue towards an underlying pathology like nutritional deficiency, immunological disease or even a leukemic state. Therefore the thorough knowledge of gingival diseases in childhood and their treatment contributes not only towards better oral care but also augments a comprehensive general pediatric care of the individual.

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