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Research Article

**GUM DISEASES IN CHILDREN****Abrar Khalid Bakhsh<sup>1\*</sup>, Shihnaz Mohammed Algarni<sup>2</sup>, Ebtisam Saud Alsubhi<sup>3</sup>, Omnia Mohammed Ageeli<sup>4</sup>, Ebtisam Salman Al Saeed<sup>5</sup>, Elaf Mohammed Malki<sup>6</sup>, Rahaf Yousif Alahmadi<sup>7</sup>, Fatemh Mousa Alhashem<sup>8</sup>**<sup>1</sup> College of Dentistry, University of Maryland, Baltimore, USA<sup>2</sup> College of Dentistry, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia<sup>3</sup> Specialized Dental Center, Ministry of Health, Yanbu, Saudi Arabia<sup>4</sup> College of Dentistry, Jazan University, Jazan, Saudi Arabia<sup>5</sup> Primary Health Care, Ministry of Health, Al Khobar, Saudi Arabia<sup>6</sup> College of Dentistry, Umm Al-Qura University, Mecca, Saudi Arabia<sup>7</sup> College of Dentistry, Taibah University, Medina, Saudi Arabia<sup>8</sup> General Practice Dentist, Almuhydib Medical Group, Dammam, Saudi Arabia**Abstract:**

Children are vulnerable to various forms of gum (or gingival) diseases, and despite being mild in most cases, they may deteriorate quickly jeopardizing the permanent teeth and periodontium throughout the adult life. Gingival diseases in children have different aetiology and clinical presentation from adults. The anatomical and histological characteristic of the gingiva in childhood make the children vulnerable to frequent and peculiar forms of gum diseases. Gum diseases range from mild gingivitis to severe destructive periodontitis. They can occur with or without plaque formation, and etiologically they can result from infectious causes (e.g. viral, bacterial, and fungal gingivitis), mechanical causes (e.g. eroded teeth, teeth malposition, mechanical appliances), traumatic causes, nutritional causes (e.g. vitamin C deficiency), drug-induced (e.g. phenytoin, nifedipine, and cyclosporin), congenital causes (e.g. congenital epulis), or associated with systemic diseases. Because most gum diseases in children are mild in severity, minimal treatment along with appropriate dental care practices are adequate to reverse the pathology and treat the diseases. Thus, early identification and diagnosis of gingival diseases in children is essential for optimum outcomes.

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## INTRODUCTION:

Children are vulnerable to various forms of gum (or gingival) diseases, and despite being mild in the vast majority of cases, they may deteriorate quickly jeopardizing the permanent teeth and periodontium throughout the adult life [1]. It is estimated that a large proportion of the gum diseases observed during adolescence and adulthood have their inception back to childhood [2]. Even though, minimal attention is given to gingival diseases in children probably due to the short life span of the primary teeth [3]. Moreover, the advances in dental therapies are increasingly directed towards adults dental health, and those concerned with children have a specific focus on oral and maxillofacial bony structures rather than soft tissues [4].

Gum diseases during the childhood period is risky for development of adults' gingivitis [2]. Despite being common, gum diseases are rarely severe in childhood and, therefore, they are underdiagnosed and often missed. However, appropriate awareness and active regular screening can easily detect them through their early signs presenting during infancy such as bleeding and inflammation. Early diagnosis and management of gingival diseases during childhood is fundamental for optimizing dental health in adults. Because the vast majority of gum diseases in children are mild in severity, minimal treatment along with appropriate dental care practices are adequate to reverse the pathology and treat the diseases [5]. Therefore, the aim of this article is to review and discuss the various forms of gum diseases that might occur in children.

## EPIDEMIOLOGY AND PATHOGENESIS OF GUM DISEASES IN CHILDREN:

Gingival diseases are prevalent among children, and it is estimated to affect from 37% and up to 73% of children between six and 11 years of old [4,6,7]. It is more common in boys than girls, and it is significantly correlated with dental and oral hygiene<sup>4,7</sup>. Though being very common, the vast majority of gum diseases are mild in severity (about 55%) and less than 5% of the cases are severe [6].

During childhood, the anatomical variation and physiological changes occurring during the transition period between the loss of primary dentition and the development of permanent teeth increase the susceptibility of the gingiva to inflammation and secondary bacterial infection [8]. For instance, during the pre-eruption stage, the formation of a firm bulge in the gingiva overlying the crown impending to

erupt results in blanching of the mucosa, reduction of the blood flow, and subsequently minimizing the immune response at the overlying mucosa. During the next stage of formation of the gingival sulcus (or margin), the erupting crown penetrates the mucosa resulting in redness, hotness, oedema, and inflammatory changes which can subsequently host bacterial proliferation. After eruption of the permanent teeth, the period when both primary and permanent teeth co-exist, the gingiva appears as a prominence attached to the erupting teeth forming a favourable space for bacterial growth [4].

Additionally, inconsistent plaque removal from the primary teeth in children results in activation of an inflammatory process and accumulation of bacteria inside the teeth. Residual dietary carbohydrates also have a role in development of gum diseases through fermentation by bacterial, and subsequent formation of acidic substances that destroy the teeth and adjacent dental and oral tissue [1]. The dental plaque and the dental biofilm activate the release of biologically active substances that stimulate cytokines release, particularly interleukin-1 beta (IL-1 $\beta$ ), interleukin 8 (IL-8), tumour necrosis factor alpha (TNF- $\alpha$ ), and prostaglandins<sup>9</sup>. These cytokines results in a wide spectrum of gingivitis from mild to severe destructive forms.

Moreover, many gingival and periodontal serious diseases may occur secondary to systemic diseases in children, and they can be the initial presentation of these systemic diseases. For instance, gingivitis and oral ulcers are reported in up to 50% of patients with Cron's disease and they often precede the gastrointestinal involvement [10]. Also, gingivitis and enamel erosion can be the initial presentation of gastro-oesophageal reflux in children [11].

## DIFFERENCES BETWEEN CHILDREN AND ADULTS:

Both children and adults are vulnerable to various gum diseases. However, little attention is given to gum diseases of infancy and childhood. Gum diseases in children are considerably different from those occurring in adults due to several factors mainly related to the anatomy and histology. The anatomical structure of the teeth and the periodontium of the primary teeth are peculiar and significantly different from those of the permanent ones [12]. First, the gingiva of the primary dentition is more reddish because it is more vascular and is covered by thinner less cornified epithelium i.e. four-cell layer thick [4]. Second, the primary teeth gingiva has shorter or even

flatter papillae arising from lamina propria and, thus, it lacks stippling [4,8]. Third, the gingival margins are more rounded and rolled and they possess a pronounced crown cervical ridge. Fourth, unlike the permanent teeth, the primary teeth eruption is associated with oedema and hyperaemia. Also, the depth of the gingiva is greater in children than in adults and it has a mean of  $2.1 \text{ mm} \pm 0.2 \text{ mm}$  [13]. The junctional epithelium of the gingiva in children can split up easily allowing a probe to be inserted deeply into the eruption area. Furthermore, the connective tissue of the gingiva in children is less developed, contains less collagen fibres, and has a less proliferative capability [13]. The cementum of children gingiva is also less dense than adults, and its apical epithelium is more hyperplastic [14]. The periodontal ligament in children is more vascular, more hydrated, less dense, and wider than adults. It contains less fibers that are parallel to the teeth long axis [13]. The dura laminae of the alveolar bone is thinner in children than adults, more vascular, less calcified, has more lymphatic drainage, and contains larger bone marrow spaces and fewer bony trabeculae [14]. Also, the width of the gingival area attached to teeth is variable in different locations, the gingiva is highly attached at the incisors and molars and loosely attached at the cuspids zone. Finally, the primary teeth are not in close contact with each other, unlike the permanent teeth, making them more vulnerable to bacterial overgrowth and subsequently gingivitis and gingival diseases [4].

Because of these anatomical and histological variations, the gum diseases in children have different entities, clinical presentation, and management protocols. Screening, early diagnosis, and preventive measures are essential for optimum outcomes. Thus, meticulous examination of periodontium in children is imperative during routine visits.

### CLASSIFICATION OF GUM DISEASES IN CHILDREN:

Several classifications have been developed for gum diseases. According to the severity of the disease, gum diseases can be classified into non-destructive (or gingivitis) or destructive (or periodontitis) diseases [15,16]. Gingivitis refers to reversible inflammation of both free and attached marginal gingiva without any loss of gingival attachment [15]. Periodontitis, on the other hand, is a destructive inflammatory process involving the teeth, teeth supporting connective tissue, and the alveolar bone resulting in nerve root exposure and loss of dentition [17]. According to the pathophysiology, gingivitis

can be categorized into gingivitis with or without plaque formation. The most commonly used classification of gum diseases depends on the etiology. Etiologically, gingivitis can be idiopathic, infectious (e.g. viral, bacterial, or fungal), mechanical, traumatic, nutritional, congenital, drug-induced, or due to systemic disease. Examples of these types of gingivitis will be addressed in the next section.

#### I. Infectious gingivitis

Infections are common causes of gingivitis in children, and they can be viral, bacterial, or fungal.

##### a) Viral gingivitis

Viral inflammation of the gingiva may be due to either localized viral infection to the oral tissue (e.g. acute herpetic gingivitis) or a part of systemic viral infection (e.g. chicken pox, infectious mononucleosis, or hand, feet, and mouth disease).

Acute herpetic gingivitis is a localized viral-induced inflammation of the gingiva and mucosal lining of the oral cavity. It is caused by herpes simplex virus type 1 (HSV-1) and commonly affects preschool children before the age of 6 years [18]. Clinically, herpetic gingivitis (or gingivostomatitis) is characterized by diffuse inflammation of the oral mucosa with on-top formation of rounded translucent vesicles that ulcerates leaving painful small ulcers with elevated whitish center and surrounding reddish margin. The ulcers recur with fever, sun exposure, and common cold [19].

Chicken pox is a systemic viral infection that affects adolescents and children below the age of 15 years. Along with the generalized cutaneous manifestations, chicken pox can affect the gingiva and the oral mucosa with characteristic small ulcers at any area of the mouth [20]. Infectious mononucleosis is another example of viral systemic illnesses associated with gingivitis. Infectious mononucleosis is caused by Epstein-Barr virus (EBV) and is characterized by generalized fatigue, malaise, and fever. Locally, the disease may present with gingivitis and gingival ulceration, gingival bleeding and petechiae, and the oral presentation usually precedes systemic illness [21]. Hand, foot, and mouth disease is a third example of systemic viral infections affecting oral mucosa caused by coxsackie viruses (group A and B). It affects infants and children between 6 months and 5 years, and is characterized by oral and perioral ulcers, and cutaneous rashes or blisters at hands and

feet [22].

### B) Bacterial gingivitis:

Bacterial infection is a less common cause of infectious gingivitis infection. Several bacterial species may result in bacterial gingivitis such as fusobacteria, spirochetes, and even the bacterial flora inhabiting the oral cavity. Bacterial infection varies from mild infection up to necrotizing ulcerative gingivitis. Children below the age of 10 years are particularly vulnerable to necrotizing forms of gingivitis [23]. Acute necrotizing ulcerative gingivitis is characterized by painful ulcers with punched out margins and a yellowish-gray overlying pseudo-membrane [23].

### C) Fungal gingivitis

Fungal gingivitis usually occurs in children with immunocompromised state. Oral candidiasis is the prototypic example of fungal infections affecting the oral cavity. It is caused by candida albicans and is common in children after receiving a course of antibiotics [24].

## II. Mechanical gingivitis

Many mechanical causes can result in inflammation and ulceration of the gingiva. Teeth malposition, loosening, or partial exfoliation, or partial erosion may result in gingival irritation, inflammation, with or without secondary infection [4]. Orthodontic appliances change the dental physiology and result in dental plaque deposition and activation of cytokine release and inflammatory cascade. Other factors associated with gingivitis include faulty practices such as over biting and mouth breathing [4].

## III. Traumatic gingivitis

Trauma to teeth or oral cavity is not an uncommon cause of gingivitis. Traumatic injuries to the periodontium tissue results in edema, inflammation, and secondary infection [4].

## IV. Nutritional gingivitis

The most common nutritional etiology of gingivitis is vitamin C deficiency (referred to as scorbutic gingivitis). Vitamin C is essential for the integrity of the oral mucosa. Therefore, vitamin C deficiency results in collagen degeneration, gingival petechiae, hemorrhage, and edema. The gingiva in scorbutic gingivitis appears bluish smooth and friable, with an

overlying necrotic pseudo-membrane [25].

## V. Drug-induced gingivitis

Several drugs can affect the gingiva. Phenytoin is one of the most common medications affecting the gingiva. It is an antiepileptic drug commonly used in focal and generalized types of epilepsies [26]. Cyclosporin and nefedipine are other examples [27,28]. These medications result in gum hyperplasia and overgrowth of interdental papillae forming nodules that encroach the lips. The hyperplastic gum appears firm and stippled particularly at the anterior portions of the gingiva [4].

## VI. Congenital gingivitis

Congenital epulis and hereditary gingival fibromatosis are common examples of congenital gingival diseases. Congenital epulis is a congenital malformation characterized by hyperplastic smooth erythematous mass arising at the alveolar ridge. It presents early during neonatal period, and it can be large enough to elevate the lips [29]. Hereditary gingival fibromatosis is a familial disease characterized by insidious progressive fibrosis of the gingiva with or without an overlying inflammation [30].

## VII. Gingivitis associated with systemic diseases

Gingivitis can occur as a part of a systemic disease. Hormonal changes during puberty can result in gingivitis. Gingival epithelium is rich in estrogen receptors that has high affinity to estrogen and testosterone. Therefore, the hormonal fluctuation occurring during puberty results in inflammation of the gingiva referred to as 'puberty gingivitis' [31]. Gingival affection can also occur secondary to blood diseases such as leukemia and thrombocytopenia. Wegeners granulomatosis also affects the gingiva resulting in a characteristic strawberry appearance of the gingiva [4].

## CONCLUSION:

Gingival diseases are common among children and they have different aetiology and presentation than adults. The anatomical and histological characteristics of the gingiva in childhood make the children vulnerable to frequent and peculiar forms of gum diseases. Gum diseases range from mild gingivitis to severe destructive periodontitis. They can occur with or without plaque formation, and etiologically they can result from infectious causes (e.g. viral, bacterial,

and fungal gingivitis), mechanical causes (e.g. eroded teeth, teeth malposition, mechanical appliances), traumatic causes, nutritional causes (e.g. vitamin C deficiency), drug-induced (e.g. phenytoin, nifedipine, and cyclosporin), congenital causes (e.g. congenital epulis), or associated with systemic diseases. Early identification and diagnosis of gingival diseases in children is essential for optimum outcomes.

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