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Periodontology Part 4: Periodontal disease in children and adolescents

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Abstract

The aim of this manuscript was to investigate the epidemiology and the factors related to the periodontal disease in children and adolescents.

Several systemic and immunological disorders have shown a relationship with periodontal disease in this population and early diagnosis and treatment of gingivitis is important to prevent it from evolving into periodontitis.

Two cases are reported showing the presencce of periodontal disease at a young age.

KEYWORDS Gingivitis; Periodontal disease; Children; Adolescents.

Introduction

In the literature the terms "periodontal disease" and "periodontitis" are commonly considered synonyms, but they have different meanings. Indeed, periodontal disease includes pathologies affecting all the supporting tissues of the teeth, including gingivitis and periodontitis [Martens et al., 2017]. Gingivitis has been defined, according to Chapple et al. [2018] in the 2017 World Workshop, as a non-specific inflammatory condition caused by a steady plaque biofilm accumulation at the gingival margin and apically. Gingivitis is considered the main risk factor and the necessary prerequisite to periodontitis.

Periodontitis is a chronic multifactorial inflammatory disease associated with dysbiotic plaque biofilms and characterised by progressive destruction of the tooth-supporting apparatus [Papapanou et al., 2018].

Periodontal diseases are common in children, adolescents, and adults, while periodontitis is relatively rare in childhood and it tends to rise during adolescence, with an important intensification of cases and a higher prevalence in adulthood. Frequently, periodontitis in the young population is caused by systemic factors, such as systemic diseases, malnutrition, hormones, gender, ethnicity, or local factors like plaque, calculus, dental anomalies, and orthodontic devices [AlGhamdi et al., 2020; Alrayyes and Hart, 2011].

Gingivitis is the most common periodontal disease in children and generally it affects up to 70% of children older than 7 years. Good oral hygiene is the primary factor that can contrast and prevent the onset of gingivitis (and therefore periodontitis) and is usually obtained with an adequate diet and appropriate mechanical procedures that can keep under control the bacterial biofilm [Nobre et al., 2016].

Control of this disease is paramount because its early onset and progression leads to bone loss, which is the main cause of edentulism among adults [Mummolo et al., 2022].

The prevalence of chronic periodontitis among children between the age of 6–14 years, in Italy, is 2% while the prevalence of aggressive periodontitis is 0.5%. Similarly, the prevalence of severe periodontal attachment loss on multiple teeth, among young adults and children in the US, is about 0.2%–0.5%. Whereas, in Moroccan schoolchildren, aggressive periodontitis was present in 4.9% of the subjects, while 6.4% of the children had chronic periodontitis [AlGhamdi et al., 2020; Alrayyes and Hart, 2011; Kissa et al., 2016].

The role of systemic diseases and other factors on periodontal disease

Since periodontal disease in young patients is often due to a systemic or immunological disorder, it is clear that early diagnosis is crucial for prevention and treatment [Alrayyes and Hart, 2011].

Different conditions or therapies can lead to periodontal diseases and their worsening; among them, there are the following.

Leukocyte Adhesion Deficiency (LAD)

Generalised periodontitis (of both dentitions) with rapid alveolar bone loss is one of the oral manifestations of LAD. This is accompanied by severe gingival inflammation (with onset during or after the eruption of the primary dentition) and early tooth loss [Alrayyes and Hart, 2011].

Inflammatory Bowel Disease (IBD)

Patients with IBD have higher incidence of dentine caries, gingival inflammation, and increased periodontal treatment

needs than controls [Koutsochristou et al., 2015].

Obesity and overweight

Different hypotheses of biological interactions for the association between obesity and periodontal diseases have been proposed, such as modification of the immune response, defective glucose tolerance, and physiological responses to stress. However, the specific mechanisms have not yet been clarified and more studies are needed in order to identify the targets for prevention or treatment [Martens et al., 2017]. According to Zuza et al. [2017], obesity in children seemed to show a susceptibility to periodontal disease and it would be important to implement prevention in these children. As described by Scorzetti et al. [2013], a test group of obese young subjects showed higher plaque index, gingival inflammation, bleeding on probing (BOP) and probing depth (PD) as well as a worse attitude towards oral hygiene compared to normal weight controls. However, in another study obese patients showed a better oral hygiene, healthier teeth and better periodontal health compared with normal-weight patients [Vallogini et al., 2017].

Diabetes Mellitus (DM)

Literature has highlighted the need for regular analyses and procedures such as glycemic values tests, HbA1C and measurement of other specific biochemical parameters of DM, because of the negative impact of hyperglycaemia on the anti-inflammatory response and on the increase of the oxidative stress in the microcirculation of periodontal tissues [Dakovic et al., 2015].

According to Diaz-Rosas et al. [2008], in diabetic patients the prevalence and severity of gingival inflammation is higher. The biofilm of the gingival sulcus interfaces with the host immune system and this results in the release of inflammatory mediators. This involves a gradual destruction of the supporting tissues of the teeth aggravated by severe immune impairment of diabetic patients. This study also suggests that factors like those related to the patients' immunological response seem to be an important control element, while the data of the influence of glycaemic control are not conclusive.

Wooton et al. [2018] stated that the gingival crevicular blood can be used to estimate blood glucose levels by transferring the sample to a portable glucose monitor. In their article it is also outlined how the collaboration between nurse practitioners (NPs) and dental hygienists (DHs) could detect, prevent, and treat periodontal disease in children thanks to physical exams by NPs and periodontal probing by DHs.

According to Novotna et al. [2015], the incidence of gingivitis in patients with type 1 diabetes is higher than in the healthy population. In addition, it increases with age. However, periodontitis in children is rare in both considered groups of subjects (healthy and children with type 1 diabetes). Moreover, in this review, some well-performed studies demonstrated a higher risk of periodontitis in children with type 1 diabetes [Novotna et al., 2015]. Lastly, as described by Diaz Rosas et al. [2019], there is significant correlation between diabetes mellitus and oral diseases in paediatric subjects.

Primary immunodeficiencies (PIDs)

Halai et al. [2020] highlighted that the cause of primary immunodeficiencies (single known gene mutation) may provide an insight into the mediators of periodontal disease and periodontal health.

Genetics

A study reported 20 loci which carry specific alleles that modify susceptibility to periodontal diseases and interact, together with the variable sex, in post-juveniles and young adults. The common alleles of the associated single-nucleotide polymorphism (SNPs) showed a risk-increasing effect in women [Freitag-Wolf et al., 2021]. Furthermore, according to Vocale et al. [2021], although only few studies are focused on Down Syndrome (DS) children and there are some differences among them, common microbiological differences have been reported between DS subjects and non-DS subjects regarding colonisation by the main periodontal pathogens already detected in primary dentition.

Socioeconomic status

A better periodontal status was observed in children that had parents with a higher socioeconomic status (SES) than those whose parents had a lower SES. A systematic review [Tadakamadla et al., 2020] showed the association between smoking parents, their level of periodontal diseases and children's periodontal status. It was found that children exposed to passive smoking and who had parents with periodontal diseases were at higher risk for periodontal diseases.

Moreover, a significantly improved periodontal health status is demonstrated for those with parents who have better oral hygiene, in terms of more frequent use of toothbrush and floss [Diamanti et al., 2021].

Dentition

In older children the plaque index (PI) values and periodontal screening and recording (PSR) scores were higher and associated with mixed dentition [Nobre et al., 2016]. Parameters considered for PSR are the following.

0) Oral health (no visible bleeding).
1) Only visible bleeding on probing: hygiene orientation.
2 Bleeding and retention factors.
3 Shallow pocket of 4-5 mm.
4) Deep pocket of ≥6 mm.
*) Furcation or recession.

Gingivitis was the most frequent periodontal disease observed and was found in a higher number of PSR code 2 (with no statistical difference with PSR code 1). In the primary and mixed dentition PSR codes 3, 4 and special code "*" had a low prevalence [Nobre et al., 2016]. Furthermore, according tothe same author [Nobre et al., 2016], clinicians should pay attention to the periodontal status during the transitions from primary dentition to mixed dentition.

Necrotizing ulcerative gingivitis (NUG)

NUG is frequently linked to systemic diseases, particularly HIV infection, stress, and malnutrition [Marty et al., 2016].

Orthodontic treatments with maxillary expansion

The buccal movement of the teeth outside the alveolar process might cause periodontal lesions like gingival recession, root resorption, dehiscence and fenestration, and reduction of buccal bone thickness and alveolar crest levels [Quinzi et al., 2019].

Gastritis and peptic ulcers

A study by Tsami et al. [2011] showed that the Helicobacter pylori detected in subgingival dental plaque of children possibly act as a reservoir, contributing to intra-familial diffusion.

Clinical presentation of periodontal disease in children and adolescents

Case 1

A case of periodontitis at late puberty is presented (Fig. 1, 2). A 16-year-old girl complained of gingival bleeding, painful gums and mobile teeth. Periodontal investigation showed generalised bleeding on probing and severe deepening of the pockets up to 10 mm. Radiographically, multiple teeth with severe bone loss and angular bony defect could be appreciated. According to the amount of bone loss, an earlier onset of periodontal breakdowncould be assumed.

The diagnosis according to the classification of Armitage [1999] was generalized aggressive periodontitis, while the diagnosis according to the classification of the European Federation of Periodontology and the American Association of Periodontology [Tonetti et al., 2018] was periodontitis, generalised stage III, grade C.

The patient was immediately prescribed a systemic antibiotic treatment (amoxicillin and metronidazole). Adjunctive local periodontal surgery led to a stabilisation of the periodontal conditions. No extractions were performed.

Case 2

A case of gingival recession is presented (Fig. 3). A 6-year-old girl showed generalised bleeding on probing and recession on 3.1 could also be appreciated.

The patient was treated with extractions and orthodontic treatment in addition to motivation to oral hygiene. The picture taken after almost 6 years shows reduction of the recession (Fig. 4), together with reduction of the full mouth bleeding score from baseline.

These types of gingival recession are not related to periodontitis.

FIG. 1 Clinical intraoral view of Case 1 at baseline.

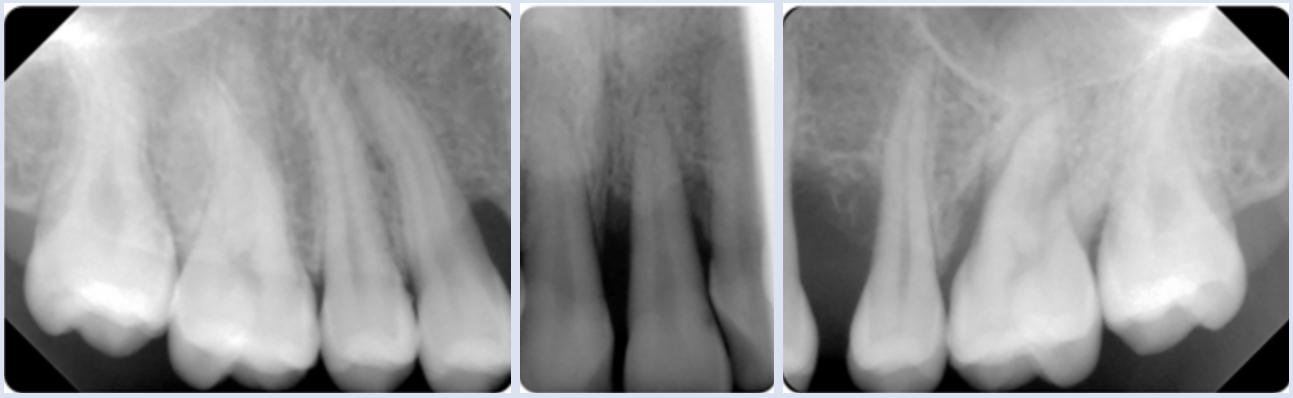

FIG. 2 Radiographically, the typical pattern of molar and incisor bone loss is evident at baseline in Case 1.

FIG. 3 Clinical aspect of Case 2 at baseline at 6 years of age (6.4 years).

FIG. 4. Clinical aspect of Case 2 after extractions and orthodontic treatment at the age of 12 (11.8 years).

Conclusion

Considering the relevance of this disease, it is very important for the clinician to intercept this problem and treat gingivitis in children and adolescents so that it does not evolve into periodontitis. To this end, it is essential to improve oral hygiene by educating and motivating the young patient to a correct prevention, an appropriate diet and regular dental visits.

References

› AlGhamdi A, Almarghlani A, Alyafi R, Ibraheem W, Assaggaf M, Howait M, Alsofi L, Banjar A, Al-Zahrani M, Kayal R. Prevalence of periodontitis in high school children in Saudi Arabia: a national study. Ann Saudi Med 2020;40,7–14.

› Alrayyes S, Hart TC. Periodontal disease in children. Dis Mon 2011;57,184–191.

› Armitage GC. Development of a classification system for periodontal diseases and conditions. Ann Periodontol 1999 Dec;4(1):1-6

› Chapple ILC, Mealey BL, et al. Periodontal health and gingival diseases and conditions on an intact and a reduced periodontium: Consensus report of workgroup 1 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Clin Periodontol 2018; 45 Suppl 20):S68–S77.

› Daković D, Mileusnić I, Hajduković Z, Čakić S, Hadži-Mihajlović M. Gingivitis and periodontitis in children and adolescents suffering from type 1 diabetes mellitus. Vojnosanit Pregl 2015;72:265-73.

› Diamanti I, Berdouses ED, Kavvadia K, Arapostathis KN, Polychronopoulou A, Oulis CJ. Oral hygiene and periodontal condition of 12- and 15-year-old Greek adolescents. Socio-behavioural risk indicators, self- rated oral health and changes in 10 years. Eur J Paediatr Dent 2021 Jun;22(2):98-106.

› Díaz Rosas CY, Cárdenas Vargas E, Castañeda-Delgado JE, Aguilera-Galaviz LA, Aceves Medina MC. Dental, periodontal and salivary conditions in diabetic children associated with metabolic control variables and nutritional plan adherence. Eur J Paediatr Dent 2018;19:119-126.

› Freitag-Wolf S, Munz M, Junge O, Graetz C, Jockel-Schneider Y, Staufenbiel I, Bruckmann C, Lieb W, Franke A, Loos BG, Jepsen S, Dommisch H, Schaefer AS. Sex-specific genetic factors affect the risk of early-onset periodontitis in Europeans. J Clin Periodontol 2021;48:1404-1413.

› Halai H, Somani C, Donos N, Nibali L. Periodontal status of children with primary immunodeficiencies: a systematic review. Clin Oral Investig 2020 Jun;24(6):1939-1951.

› Kissa J, Chemlali S, El Houari B, Amine K, Khlil N, Mikou S, Nadifi S, Albandar JM. Aggressive and chronic periodontitis in a population of Moroccan school students. J Clin Periodontol 2016;43:934-939.

› Koutsochristou V, Zellos A, Dimakou K, Panayotou I, Siahanidou S, Roma-Giannikou E, Tsami A. Dental caries and periodontal disease in children and adolescents with inflammatory bowel disease: a case-control study. Inflamm Bowel Dis 2015;21:1839-46.

› Martens L, De Smet S, Yusof MY, Rajasekharan S. Association between overweight/obesity and periodontal disease in children and adolescents: a systematic review and meta-analysis. Eur Arch Paediatr Dent 2017;18:69-82.

› Marty M, Palmieri J, Noirrit-Esclassan E, Vaysse F, Bailleul-Forestier I. Necrotizing periodontal diseases in children: a literature review and adjustment of treatment. J Trop Pediatr 2016;62:331-7.

› Mummolo S, Cirillo E, Ciribè M, Manenti RJ, Galeotti A. Periodontology. Part 1: Gingivitis in adolescence. Review of the literature and case reports. Eur J Paediatr Dent 2022;23(1):79-82.

› Nobre CM, Fernandes-Costa AN, de Melo Soares MS, Pugliesi DM, de Vasconcelos Gurgel BC. Periodontal disease detection in primary and mixed dentitions. Eur Arch Paediatr Dent 2016;17:407-411.

› Novotna M, Podzimek S, Broukal Z, Lencova E, Duskova J. Periodontal diseases and dental caries in children with type 1 diabetes mellitus. Mediators Inflamm. 2015;2015:379626.

› Papapanou PN, Sanz M et al. Periodontitis: Consensus report of Workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Clin Periodontol 2018;45(Suppl 20):S162–S170.

› Quinzi V, Rossi O, Paglia L, Marzo G, Caprioglio A. Paediatric Orthodontics Part 2: Periodontal effects of maxillary expansion. Eur J Paediatr Dent 2019;20:164-6.

› Scorzetti L, Marcattili D, Pasini M, Mattei A, Marchetti E, Marzo G. Association between obesity and periodontal disease in children. Eur J Paediatr Dent 2013;14:181-4.

› Tadakamadla SK, Tadakamadla J, Kroon J, Lalloo R, Johnson NW. Effect of family characteristics on periodontal diseases in children and adolescents-A systematic review. Int J Dent Hyg 2020;18:3-16.

› Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. J Periodontol 2018;89 Suppl 1:S159-S172. Erratum in: J Periodontol 2018;89:1475.

› Tsami A, Petropoulou P, Kafritsa Y, Mentis YA, Roma-Giannikou E. The presence of Helicobacter pylori in dental plaque of children and their parents: is it related to their periodontal status and oral hygiene? Eur J Paediatr Dent 2011;12:225-30.

› Vallogini G, Nobili V, Rongo R, De Rosa S, Magliarditi F, D'Antò V, Galeotti A. Evaluation of the relationship between obesity, dental caries and periodontal disease in adolescents. Eur J Paediatr Dent 2017;18:268-272.

› Vocale C, Montevecchi M, D'Alessandro G, Gatto M, Piana G, Nibali L, Re MC, Sambri V. Subgingival periodontal pathogens in Down syndrome children without periodontal breakdown. A case-control study on deciduous teeth. Eur J Paediatr Dent 2021;22:309-13.

› Wooton AK, Melchior LM, Coan LL, Reddington AR. Periodontal disease in children with type 2 diabetes mellitus. Nurse Pract 2018;43:30-35.

› Zuza EP, Nascimento LA, Caetano SL, Barroso EM, de Toledo BE, Rosetti EP, Pires JR. Periodontal Disease and Body Weight Assessment in Children. J Dent Child (Chic) 2017;84:3-8.