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Diagnosis Of Children With Catarrhal Gingivitis On The Background Of Bronchial Asthma

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Abstract: Background: Chronic catarrhal gingivitis is the most common periodontal disease in childhood, and children with bronchial asthma are exposed to additional risk factors such as inhaled medication, reduced salivary flow and mouth breathing. Aim: To summarise current evidence on the prevalence of gingivitis in children with bronchial asthma and to substantiate a diagnostic algorithm for catarrhal gingivitis in this group. Methods: A narrative review of case–control and prospective studies, consensus reports and national publications was carried out; the diagnostic indices of gingival inflammation and oral hygiene were systematised, and quantitative results of clinical studies were extracted and presented graphically. Results: In a prospective study of 51 children with asthma using inhaled corticosteroids and 51 controls, gingivitis was found in 60.8% and 23.5% of children, respectively ($p < 0.001$), and salivary flow was lower in the asthma group; after a dental care programme the prevalence fell to 11.1% after one year. Other studies reported poorer oral hygiene, more frequent mild and moderate gingival inflammation and higher Community Periodontal Index values in children with asthma, although not all studies found differences. Conclusion: Diagnosis of catarrhal gingivitis in children with asthma should include a history of asthma therapy, clinical examination, index assessment (gingival, PMA, plaque and bleeding indices), and, where indicated, salivary, microbiological and microcirculatory tests, followed by an individual preventive plan.

Keywords: catarrhal gingivitis, children, bronchial asthma, inhaled corticosteroids, gingival index, PMA index, oral hygiene, diagnosis.

Introduction

Inflammatory periodontal diseases begin in childhood, and plaque-induced gingivitis is their most frequent form in children and adolescents. According to the current classification, gingivitis is a reversible inflammation of the gingiva caused by the dental biofilm and modified by systemic and local factors, without loss of periodontal attachment [1]; a case of gingivitis is defined by the proportion of sites with bleeding on probing, which makes standardised diagnosis possible in epidemiological and clinical settings [2]. Because untreated gingivitis is the precursor of periodontitis, which affects a large part of the adult population [3], its early diagnosis in children is an important preventive task.

Bronchial asthma is the most common chronic disease of childhood: the Global Asthma Network has shown that asthma symptoms remain highly prevalent among school-aged children worldwide [4]. Children with asthma receive inhaled corticosteroids and β2-agonists for long periods, often breathe through the mouth and may have reduced salivary flow, all of which can promote plaque accumulation and gingival inflammation. Clinical studies have shown that asthmatic children aged 6–10 years receiving bronchodilators through an inhaler have higher plaque severity and more gingivitis than their healthy peers, and that plaque accumulation and gingivitis increase with the severity and duration of asthma [5]. National authors also regard general somatic diseases as important modifying factors of periodontal inflammation [6].

Nevertheless, the diagnosis of catarrhal gingivitis in children with asthma is usually carried out according to the general scheme, without taking into account the specific features of the disease and its treatment. The aim of this article is to summarise current evidence on the prevalence of gingivitis in children with bronchial asthma and to substantiate a diagnostic algorithm for chronic catarrhal gingivitis in this group of patients.

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Materials And Methods

A narrative review of the literature was carried out. Publications were identified in the PubMed, Scopus, Google Scholar and eLIBRARY databases using combinations of the keywords “gingivitis”, “children”, “bronchial asthma”, “inhaled corticosteroids”, “gingival index”, “oral hygiene” and “saliva”. Case–control, cross-sectional and prospective studies of children with asthma that reported gingival or oral hygiene outcomes, consensus reports on the classification and case definition of gingivitis and national monographs and articles on the aetiology, pathogenesis and diagnosis of periodontal diseases were included.

The diagnostic indices used in the reviewed studies were systematised: the gingival index of Löe and Silness [7], the plaque index of Silness and Löe [8], the simplified oral hygiene index OHI-S [9], the gingival bleeding index and the visible plaque index [10] and the papillary–marginal–alveolar (PMA) index [11], together with the Schiller–Pisarev iodine test, which is widely used in national practice to detect glycogen accumulation in the inflamed gingiva [12]. For each clinical study, the sample, the comparison groups and the main results were extracted from the original publication without modification, and the results were synthesised descriptively.

Results

Prevalence of gingivitis in children with asthma. The most detailed data were obtained in a prospective controlled study of 102 children aged 4–16 years, 51 of whom had asthma and had used inhaled corticosteroids for at least one year [13]. At the first examination, gingivitis was found in 60.8% of children with asthma and in 23.5% of controls ($p < 0.001$); children with asthma brushed their teeth less often and had a lower salivary flow rate (3.878 vs 4.684 mL/min at the first visit, $p < 0.001$), whereas salivary pH did not differ. After a dental care programme with oral hygiene instruction and fluoridation, the prevalence of gingivitis in the asthma group decreased to 12.2% at six months and 11.1% at one year (Figure 1).

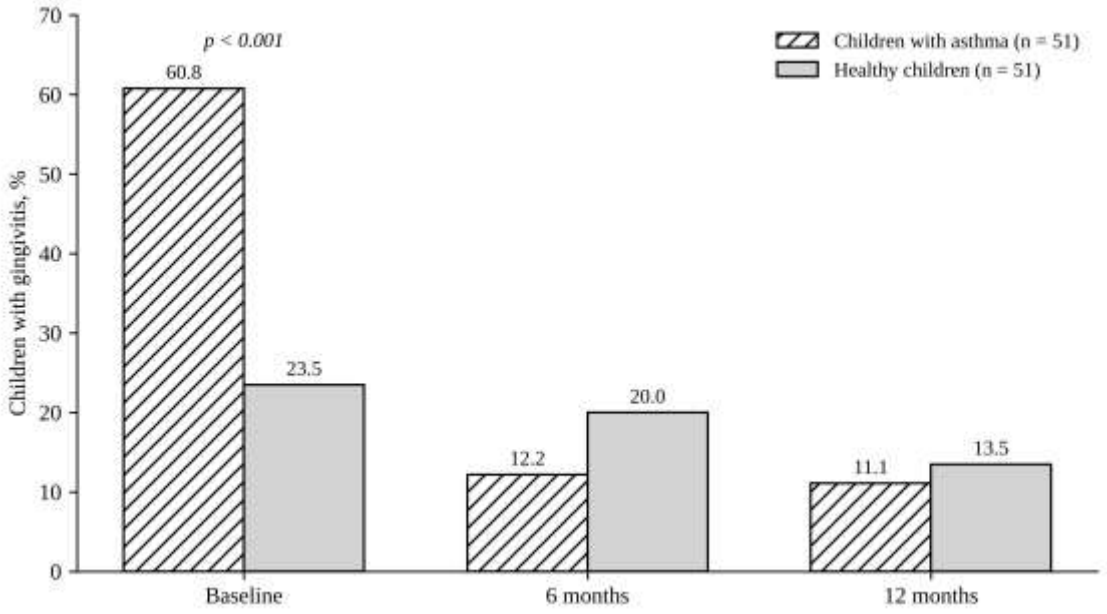


Figure 1. Prevalence of gingivitis in children with bronchial asthma and healthy children before and after a dental care programme

In an epidemiological study of 68 children with asthma and 68 healthy children aged 6–16 years, poor oral hygiene and mild and moderate gingival inflammation were more common in children with asthma, mean Community Periodontal Index values were higher ($p < 0.001$), and taking medication in the afternoon was associated with higher plaque and gingival index values [14]. At the same time, a case–control study of 46 asthmatic and 47 non-asthmatic children aged 6–12 years found no significant differences in visible plaque (54.3% vs 59.6%) or in caries of primary teeth, and gingivitis was not a significant factor in the final regression model [15]. The main studies are summarised in Table 1.

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Table 1. Clinical studies of gingival status and oral hygiene in children with bronchial asthma

Study	Sample	Main result
Kilinc et al., 2016 (Turkey)	51 children with asthma on ICS and 51 controls, 4–16 years; follow-up 1 year	Gingivitis 60.8% vs 23.5% ($p < 0.001$); lower salivary flow; gingivitis 11.1% after care programme
Davidović et al., 2018 (Serbia)	68 children with asthma and 68 controls, 6–16 years	Poorer hygiene and more mild/moderate gingivitis in asthma; higher CPI ($p < 0.001$)
Kumar et al., 2019 (India)	70 asthmatic and 70 non-asthmatic children, 6–10 years	More plaque and gingivitis in asthma; increase with severity and duration of asthma
Bahrololoomi et al., 2018 (Iran)	46 asthmatic and 47 non-asthmatic children, 6–12 years	No significant difference in visible plaque and dmft; gingivitis not significant in final model

Note: ICS – inhaled corticosteroids; CPI – Community Periodontal Index. Compiled by the author from the cited publications.

Pathogenetic basis of diagnosis. In catarrhal gingivitis, the bacterial flora of dental plaque is the main causative factor, and its damaging effect depends on the state of general and local defence mechanisms [16]. The oral cavity is a balanced ecological system in which saprophytic and opportunistic microorganisms maintain colonisation resistance; up to half of its microbial community consists of gram-positive cocci, mainly streptococci, and gingival inflammation develops when this balance shifts towards gram-negative anaerobes [17]. Antibacterial therapy, reduced immunity and somatic diseases activate fungi of the genus Candida and other opportunistic species [18], which is of particular importance for children using inhaled corticosteroids. Microcirculatory disorders of the gingiva precede the clinical signs of inflammation, and laser Doppler flowmetry makes it possible to record gingival blood flow non-invasively and to detect such disorders at early stages [19].

Diagnostic indices. The indices used for diagnosis of catarrhal gingivitis differ in what they measure and how they are interpreted (Table 2). For children with asthma, it is advisable to combine an index of oral hygiene with indices of gingival inflammation and bleeding, since the history of inhaled therapy, rinsing after inhalation and the time of medication intake affect both plaque accumulation and inflammation.

Table 2. Indices used in the diagnosis of catarrhal gingivitis in children

Index / test	What is assessed	Scoring and interpretation
Gingival index (Löe–Silness)	Colour, oedema and bleeding of the gingiva at four sites per tooth	0–3 per site; 0.1–1.0 mild, 1.1–2.0 moderate, 2.1–3.0 severe gingivitis
PMA index (Parma)	Extent of inflammation: papillary, marginal, alveolar gingiva	Percentage of affected gingival units; < 30% mild, 31–60% moderate, > 60% severe
Plaque index (Silness–Löe)	Thickness of plaque at the gingival margin	0–3 per site; mean value per mouth
OHI-S (Greene–Vermillion)	Debris and calculus on six index teeth	0–6; 0–1.2 good, 1.3–3.0 fair, 3.1–6.0 poor hygiene
Gingival bleeding index (Ainamo–Bay)	Bleeding after gentle probing of the sulcus	Percentage of bleeding sites
Schiller–Pisarev test	Glycogen accumulation in inflamed gingiva (iodine staining)	Intensity of staining indicates severity of inflammation

Note: compiled by the author on the basis of the cited publications.

Discussion

The reviewed studies indicate that children with bronchial asthma, especially those using inhaled corticosteroids, tend to have more gingivitis and poorer oral hygiene than their healthy peers, although the results are not uniform. The differences between studies can be explained by the age of the

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children, the drugs and inhalation devices used, the time of medication intake, rinsing habits and the indices applied. Importantly, the decrease in the prevalence of gingivitis among asthmatic children after a dental care programme shows that gingival inflammation in this group is largely preventable and that early diagnosis is justified.

On the basis of the reviewed data, a diagnostic algorithm for chronic catarrhal gingivitis in children with bronchial asthma is proposed (Figure 2). It includes a history focused on asthma therapy and hygiene habits, clinical examination, index assessment with determination of the extent and severity of inflammation, additional salivary, microbiological and microcirculatory tests and an individual plan of prevention and treatment. The choice of local treatment should take into account the risk factors identified: national studies have shown that the long-term results of treating chronic gingivitis depend on regular follow-up and maintenance of hygiene [20], rational antimicrobial therapy should be used only when indicated [21], and a combination of therapeutic and prophylactic oral care products improves prevention results [22]. Systemic risk factors, including chronic somatic diseases, should be recorded in the dental card [23]. The algorithm is a conceptual proposal and requires validation in controlled clinical studies; the main limitation of this review is the small number and heterogeneity of studies of gingivitis in children with asthma.

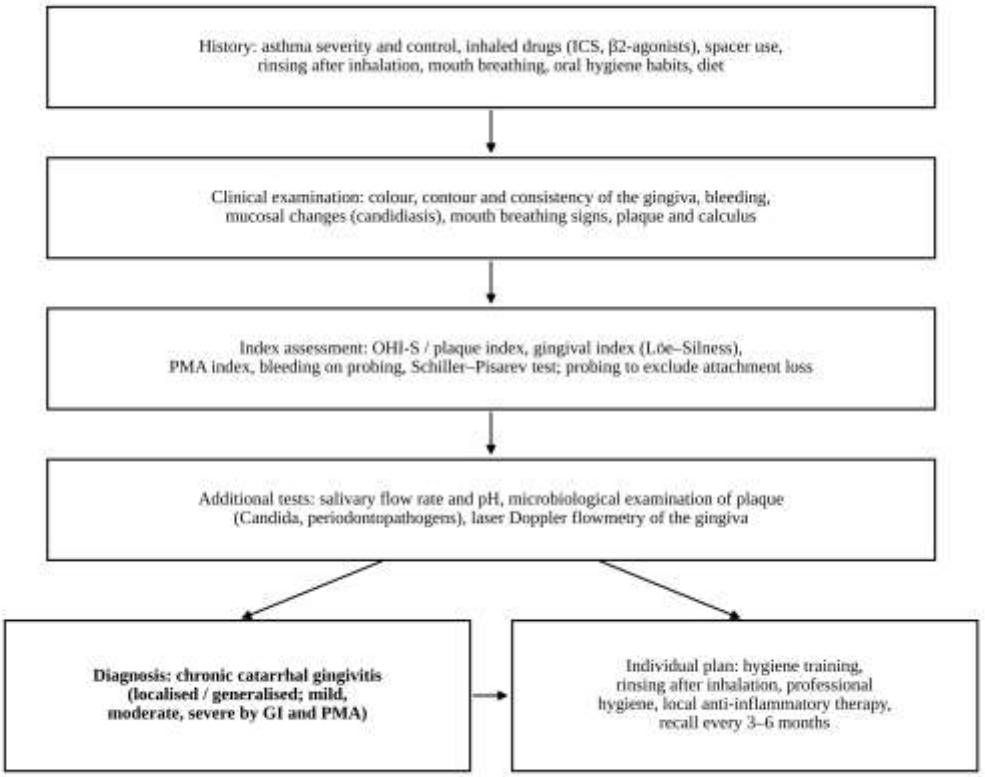


Figure 2. Proposed algorithm for the diagnosis of chronic catarrhal gingivitis in children with bronchial asthma

Conclusion

Children with bronchial asthma form a risk group for chronic catarrhal gingivitis because of inhaled medication, reduced salivary flow, mouth breathing and insufficient oral hygiene; in a prospective study, gingivitis was found in 60.8% of asthmatic children compared with 23.5% of healthy children, and its prevalence fell to 11.1% after a dental care programme. Diagnosis of gingivitis in these children should therefore combine a history of asthma therapy with clinical examination, the gingival, PMA, plaque and bleeding indices and the Schiller–Pisarev test, and, where indicated, assessment of salivary flow, microbiological examination and laser Doppler flowmetry. It is advisable to examine children with asthma every three to six months, to teach them to rinse the mouth after inhalation and to brush twice a day, and to coordinate dental prevention with the paediatrician and allergist; controlled studies are needed to validate the proposed diagnostic algorithm.

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