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The influence of asthma onset and severity on malocclusion prevalence in children and adolescents

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Abstract

Objective: The influence of asthma, its severity levels and onset time on malocclusion occurrence were investigated. **Methods:** The sample was composed by 176 children/adolescents, of both genders, aged 3 to 15 years, that were divided in two groups. The asthma group (AG) enrolled 88 children/adolescents that were seen at the Breathe Londrina Program. The asthma-free group (AFG) enrolled 88 preschool and school children recruited in 2 public schools. Malocclusion diagnosis was made according to WHO criteria (OMS, 1999). **Results:** A higher prevalence in malocclusions in asthmatic patients in mixed dentition was observed when compared to controls ($p<0.05$). On the other hand, these results were not observed for deciduous ($p>0.05$) and permanent dentition ($p>0.05$). A significant association was seen between asthma onset time and marked maxillary overjet ($p<0.05$), and open bite ($p<0.05$) in the mixed dentition, being both conditions more common among those that have presented the symptoms of asthma prior to 12 months of age. **Conclusion:** The results of this study indicate that the early manifestation of asthma at first year of life can cause dentofacial changes. Therefore, the prompt diagnostic of the illness, as well as the establishment of a proper therapy could improve the symptoms and chronic complications of asthma and also reduce its impact on craniofacial development.

Keywords: Asthma. Malocclusion. Child. Adolescent.

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INTRODUCTION

Asthma is a chronic disease that affects millions of people around the world from different ethnic and social background.[12] Its incidence has increased in recent decades, and according to an estimate by the World Health Organization, in 2005, the costs of asthma medication outstrip the costs for AIDS treatment.[5] In Brazil, it affects about 20% of infantile population.[23]

Asthma affects lower airway and it causes narrowing in bronchial tubes resulting in air flow limitation, which can be reversed spontaneously or after treatment. It's symptoms vary from the form of simple coughing episode up to recurrent severe dyspnea, and may even cause death.[8] As it is a respiratory disorder, asthma may be associated with mouth breathing, which can cause changes in functional posture of oral muscles and as a consequence, changes in craniofacial development, dental position and occlusion can be observed.[9,21]

Dental literature shows contrasting results among respiratory disorders and malocclusion occurrence, especially concerning bronchial asthma. Therefore, this study aimed to evaluate the influence of asthma severity and onset in malocclusion prevalence, and in this way, provide information so that suitable dental preventive programs and therapeutic approaches can be proposed in order to reduce possible orofacial deformities related to asthma.

MATERIAL AND METHODS

Experimental design and study population

The University of Northern Paraná Ethical Committee (Londrina-PR, Brazil) approved this study. This cross-sectional comparative study evaluated relation between asthma severity and onset on the prevalence of malocclusion in 3 to 15 years-old children. The study population was composed by two groups: Asthma group and control group (both were divided according to the dentition phase in deciduous, mixed and permanent).

One hundred children and adolescents from Breathe Londrina Program were invited to join the research. However, two patients were excluded because they were using orthodontic appliances and 10 patients missed the dental appointment scheduled for clinical exam. Therefore, the sample from asthma group (AG) was composed by 88 asthmatic children and adolescents.

The asthma-free group (AFG) was also composed by 88 children and adolescents of age, gender and social background similar to the AG group, randomly selected from two public schools, one in the west region and other in the south of the municipality.

Data gathering

Data gathering was performed from February to October 2007 by two dentists, one was responsible for the interview and the other for the nasal breathing test and clinical examination. Before any methodological procedure, the parents/legal guardians were informed about the risks and benefits of the study and only after a written informed consent was obtained, the patient was included in the research, as demanded by Brazilian CNS 196/96 resolution.

The parents were interviewed on medical and dental history of their children, with special regard to bronchial asthma history (disease onset and its pharmacological treatment). These data were used to classify asthma severity (Table 1), which was confirmed through patients' medical records. Moreover, retrospective data concerning non-nutritive sucking (such as digital sucking and pacifier's use) and the presence of allergic rhinitis were also assessed by the questionnaire.

The data obtained for asthma severity classification were also compared to those in the patients medical records. For those cases in which the severity classification based on the parents/legal guardians interview did not coincide with the medical records, the latter was used.

FIGURE 1 - Classification of asthma severity (adapted from Shulman et al,[17] 2001).

Category	Occurrence at last year
Severe	2 hospitalizations or 4 acute events
Moderate	1 hospitalization or 2 acute events or 3 events of respiratory difficulties
Mild	No hospitalization or 1 acute event or 2 events of respiratory difficulties

The test described by Menezes et al[13] was performed to evaluate the nasal breathing. In this test, the patient must put water into the mouth and keep the lips closed without swallowing water during 3 minutes. The patients who open the lips or swallow the water are considered mouth breathers.

Clinical examination was performed by one previously calibrated orthodontist (kappa = 0.96) according to the criteria described by World Health Organization[14] for diagnosis of crowding and spacing in the anterior segments; maxillary and mandibular overjet; overbite; anterior open bite; posterior crossbite. The molar relation was based on Angle's classification[1] for permanent teeth and Tomita, Bijella, Franco[20] criteria for deciduous ones.

Statistical analysis

A multivariate logistic regression (Forward Stepwise Likelihood Ratio) was performed, with the following variables included in the model: Asthma, allergic rhinitis, digital suction, impaired nasal breathing and pacifier use after 2 years of age.

Chi Square test (X^2) was used, with 95% confidence interval and 5% significance level, to ascertain the associations between malocclusions and asthma (severity and onset). To allow bivariate analysis, the variables that presented more than one category were grouped and converted to dichotomous variables. When the cells showed reduced numbers, G-test with Yate's correction was applied instead of Chi Square test.

Statistical analysis was performed at the Statistical Package for Social Sciences 15.0 (SPSS) software.

RESULTS

One hundred seventy six children and adolescents were recruited for this research, being 88 in the asthma group (AG) and 88 in the asthma-free group (AFG). The patients were split into three groups: Deciduous dentition (n=30), mixed dentition (n= 109) and permanent dentition (n=37). Regarding gender, 103 patients were female while 73 were male (Table 1). The mean age of children from AG was similar to the mean age of those from AFG, except in the mixed dentition group, whereas AFG age was higher than AG (Table 2).

No statistical differences were observed between the groups concerning the following variables: molar relation (Chi Square= 0.390 and p> 0.05), spacing in anterior region (Chi Square= 0.846 and p>0.05), crowding (Chi Square= 0.834 and p>0.05), crossbite (Chi Square= 1.10 and p>0.05), maxillary overjet (Chi Square= 0.112 and p>0.05) and open bite (Chi Square= 0.226 and p>0.05). Despite the prevalence of malocclusion seems to be higher in the asthma group, no statistical differences were observed between the groups (Chi Square= 2.79 and p>0.05).

However, an increased malocclusion prevalence in the asthma group was observed in the mixed dentition when compared to asthma-free group (Chi Square= 4.54 and p<0.05). On the other hand, no differences were observed for the deciduous (G test= 0.44 and p>0.05) and permanent dentitions (G test= 0.01 and p>0.05).

Considering that malocclusion occurrence was higher in asthma group and that other variables such as impaired nasal breathing and non-nutritive sucking habits are involved in malocclusion etiology, a multivariate analysis was performed in order to control these variables.

Asthma and impaired nasal breathing were related to malocclusion occurrence through logistic regression. However, no association was observed between allergic rhinitis or non-nutritive sucking habits and malocclusion (Table 3). Indeed, asthma was not related to functional changes in stomatognathic system, such as nasal breathing and tongue position. Asthma severity did not seem to influence neither the molar relation nor the presence of crossbite, overjet and open bite in the studied population.

Symptoms onset was correlated to the presence of an increased maxillary overjet in the mixed dentition (Table 4), usually in patients whose asthma started at one year of age. Moreover, a significant association between symptoms onset and the presence of open bite was also observed in mixed dentition. In this subgroup, all the patients showing open bite had asthma onset at one year of age (Table 5).

DISCUSSION

The present study is part of a project designed to evaluate asthma's impact on oral health whereas the following variables were studied: dental caries, oral hygiene, dental enamel defects (enamel opacities and dental fluorosis), salivary levels of cariogenic bacteria (S. mutans and Lactobacillus ssp) as well as Candida ssp; salivary properties and malocclusion prevalence. The children and adolescents enrolled in this research are assisted by Breathe Londrina Program. This program started in 2003 aiming to improve the quality of health assistance provided to asthmatic patients. It aims to integrate the activities of primary, specialized and hospital care, as well as to qualify measures to control home environment and use the most appropriate drug therapy for each clinical situation. Drug therapy is based on the use of beclometasone in powder form, inhalation or spray, and albuterol in the form of an inhaled spray.

TABLE 1 - Distribution of the studied population according to group, dentition and gender.

Dentition	Gender	Group			
		AFG		AG	
		n	%	n	%
Deciduous	Male	4	36.36	9	47.37
	Female	7	63.64	10	52.63
Mixed	Male	23	37.10	20	42.55
	Female	39	62.90	27	57.45
Permanent	Male	3	20.00	14	63.64
	Female	12	80.00	8	36.36

TABLE 2 - Comparison of mean age according to group and dentition.

Dentition	Group	n	Age		t	p
			mean	SD		
Deciduous	AFG	11	4.55	1.44	0.04	0.97
	AG	19	4.53	0.84		
Mixed	AFG	62	9.16	1.43	2.26	0.03
	AG	47	8.40	2.06		
Permanent	AFG	15	12.40	1.45	0.18	0.87
	AG	22	12.32	1.25		

TABLE 3 - P value, odds ratio and confidence intervals of malocclusion prevalence according to the presence of asthma, allergic rhinitis, pacifier use after 2 years of age, digital suction and impaired nasal breathing

Variable	P value	OR	CI 95%
Asthma	0.02	2.47	1.14 - 5.37
Allergic rhinitis	0.11	0.47	0.18 - 1.20
Pacifier use	0.45	0.75	0.36 - 1.58
Digital suction	0.72	1.24	0.38 - 4.00
Impaired nasal breathing	0.00	6.24	2.08 - 18.73

TABLE 4 - Relation between maxillary overjet and asthma onset symptoms, according to dentition phase.

Dentition	Maxillary overjet	Symptoms onset				X^2	p
		After 12 months		Before 12 months			
		n	%	n	%		
Deciduous	Normal	6	50.00	6	50.00	0.03	0.86
	Increased	3	42.86	4	57.14		
Mixed	Normal	21	67.74	10	32.26	7.74	0.01
	Increased	4	25.00	12	75.00		
Permanent	Normal	13	68.42	6	31.58	0.27	0.60
	Increased	1	33.33	2	66.67		

TABLE 5 - Relation between the presence of open bite and asthma onset symptoms, according to dentition phase.

Dentition	Maxillary overjet	Symptoms onset				X^2	p
		After 12 months		Before 12 months			
		n	%	n	%		
Deciduous	Absent	6	40.00	9	60.00	0.47	0.49
	Present	3	75.00	1	25.00		
Mixed	Absent	25	59.52	17	40.48	4.66	0.03
	Present	0	0.00	5	100.00		
Permanent	Absent	14	63.64	8	36.36	**	**
	Present	0	0.00	0	0.00		

Those enrolled in the program have monthly meetings and lectures with health professionals, where they receive information about the disease. The assessment of its impact was very positive because there was reduced number of crises and hospitalizations, which resulted in less suffering for patients and savings for the health system.[4]

There are many reports about the association between malocclusion and upper airway tract diseases. However, there is a lack of information about lower airway tract disorders, such as asthma, and malocclusion development. Upper and lower airway disorders have the same pathogenesis[6,19] and they are usually present at the same patient. Epidemiological studies showed that nearly 74% to 81% of asthmatic patients have also allergic rhinitis.[7,11,19] It is important to point out that patients with allergic rhinitis or asthma as well as patients with nasal septum deviation, enlarged adenoids or nasal polyp generally present mouth breathing,[3,16] which is often related to malocclusion etiology.[18] Barros et al,[2] in a cross-sectional study, observed a positive correlation between allergic rhinitis and mouth breathing. Venetikidou[21] also reported a higher prevalence of mouth breathing in asthmatic patients. On the other hand, no association between asthma and impaired nasal breathing was observed in this study, even in patients with moderate or severe asthma. However, through multivariate analysis, it was observed that patients with an impaired nasal breathing showed a higher occurrence of malocclusion.

The contrasting results of this study in comparison to Barros et al[2] and Venetikidou[21] could be explained considering the fact that asthmatic patients enrolled in this study take part of a program whereas the treatment is based on use of inhaled corticosteroid,[4] powerful anti-inflammatory drugs[15] which reduce the inflammation on upper and lower airway tract and, consequently, improve nasal breathing.[10] Wenzel et al[22] reported that inhaled budesonide can reduce nasal obstruction in allergic children and, therefore, normalize possible changes in craniocervical angulations observed. However, cohort studies are necessary to evaluate if pharmacological treatment of asthma can effectively improve nasal breathing, preventing the establishment of malocclusion.

Bivariate and multivariate analysis showed higher prevalence of malocclusion and consequent facial changes in asthmatic children and adolescents when compared to control ones. These changes in occlusal features (increased maxillary overjet and open bite) are more common in patients with an early disease onset, when the disease started at the first year of age, especially in mixed dentition group. Faria et al[9] also reported an association between asthma onset and dentofacial changes observed in adults. Actually, the authors verified that crossbite and crowding are often observed in asthmatic adults in whom the disease begun before 14 years of age. However, Venetikidou[21] showed no statistically differences among overbite and overjet prevalence in asthma group when compared to control one.

Dental crowding can be influenced by functional changes, such as impairment of nasal breathing and presence of lower airway tract diseases (asthma).[9] On the other hand, no association between asthma and dental crowding was observed at this study.

No differences were observed among asthma and control group concerning the crossbite incidence, even when asthma severity and the disease onset are considered in the analysis. Nevertheless, Venetikidou[21] and Faria et al[9] reported a positive correlation between asthma and crossbite prevalence.

In this study, there were no association between asthma severity and the presence of any change in occlusal features related to malocclusion, such as modified molar relation, presence of spacing in the anterior regions, increased maxillary overjet or open bite. These results are in agreement with Faria et al[9] who found no association between asthma severity and malocclusion in adults, despite other study have previously reported this correlation in children.[22]

The findings of this study showed that early asthma onset, especially at the first year of age can

evoke dentofacial changes. Therefore, the prompt diagnosis of asthma, as well as the correct pharmacological treatment, could improve not only its symptoms and chronic complications, but also it could reduce its impact on craniofacial development. Special oral health attention should be provided to asthmatic children and adolescents as well as it can be recommended that dentists should be included at the multidisciplinary team involved in asthma assistance.

CONCLUSIONS

According to the present results, it can be concluded that:

- » Asthma is associated to malocclusion prevalence.
- » There is no correlation between asthma severity and malocclusion.
- » Asthma onset can influence malocclusion's establishment, especially when the disease started at the first year of age.

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