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Changes in chewing and swallowing secondary to allergic rhinitis and asthma in children and adolescents - integrative review

Alterações da mastigação e deglutição secundárias à rinite alérgica e à asma em crianças e adolescentes – revisão integrativa

Alteraciones de la masticación y deglución secundaria a la rinitis alérgica y el asma en niños y adolescentes - revisión integrativa

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Abstract

Introduction: Asthma and allergic rhinitis have been considered as manifestations of the same syndrome, since they have common epidemiological, genetic and pathophysiological bases. The interaction between difficulty in breathing function, asthma and allergic rhinitis may promote changes in the stomatognathic system, such as chewing and swallowing functions, as well as anatomical and functional changes in facial and somatic growth. **Objective:** To perform an integrative review of chewing and swallowing assessment in children and teenagers with rhinitis and asthma**. Materials and Methods:** We searched the Lilacs, MedLine, PubMed and Scielo databases for articles on swallowing and chewing in children and teenagers with asthma and rhinitis in January and February 2017, and this research was updated in June 2018. **Results:** A total of 2,537 articles were found, but only five presented the eligibility

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Authors'contributions:
MAC participated in the idealization of the study, data collection, analysis and interpretation and article writing. SMS AND PR-SMF participated in data collection; BCLA participated, tutoring, in the idealization of the study, analysis, interpretation of data and writing of the article.

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criteria**. Discussion:** Few studies regarding the topic were found. Of the five articles selected, three inferred to find no alterations and two found altered patterns, relating to the nasal obstruction factor. More research is needed on the subject. **Conclusion:** There is no scientific evidence to support the presence of chewing and swallowing disorders due to asthma and rhinitis in children and teenagers.

Keywords: Asthma; Rhinitis; Speech, Language and Hearing Sciences.

Resumo

Introdução: A asma e a rinite alérgica têm sido consideradas manifestações de uma mesma síndrome, uma vez que apresentam bases epidemiológicas, genéticas e fisiopatológicas comuns. A interação entre a dificuldade na função de respiração, a asma e a rinite alérgica podem promover alterações no sistema estomatognático, como as funções de mastigação e a deglutição, além de modificações anatômicas e funcionais, no crescimento facial e somático. **Objetivo:** Realizar uma revisão integrativa da avaliação da mastigação e deglutição em crianças e adolescentes com rinite e asma. **Materiais e Métodos:** Foi realizada uma pesquisa nas bases de dados *Lilacs, MedLine, PubMed e Scielo,* sobre artigos que abordavam a deglutição e mastigação em crianças e adolescentes com asma e rinite no período de janeiro e fevereiro de 2017, e a pesquisa foi atualizada em junho de 2018. **Resultados:** Foram encontrados 2.537 artigos, mas apenas cinco apresentaram os critérios de elegibilidade. **Discussão:** Poucos estudos referentes ao tema foram encontrados. Dos cinco artigos selecionados, três inferiram não encontrar alterações e dois encontraram padrões alterados, relacionando com o fator de obstrução nasal. É necessário que mais pesquisas sejam realizadas sobre o tema. **Conclusão:** Não há evidências científicas que afirmem a presença de alterações de mastigação e deglutição decorrentes da asma e da rinite em crianças e adolescentes.

Palavras-chave: Asma; Rinite; Fonoaudiologia.

Resumen

Introducción: El asma y la rinitis alérgica se han considerado manifestaciones de un mismo síndrome, ya que presentan bases epidemiológicas, genéticas y fisiopatológicas comunes. La interacción entre la dificultad en la función de respiración, el asma y la rinitis alérgica pueden promover alteraciones en el sistema estomatognático, como las funciones de masticación y deglución, además de modificaciones anatómicas y funcionales, en el crecimiento facial y somático. **Objetivo:** Realizar una revisión integrativa de la evaluación de la masticación y deglución en niños y adolescentes con rinitis y asma. **Materiales y Métodos:** Se realizó una investigación en las bases de datos Lilacs, MedLine, PubMed y Scielo, sobre artículos que abordaban la deglución y masticación en niños y adolescentes con asma y rinitis en el período de enero y febrero de 2017, la investigación fue actualizada en junio de 2018. **Resultados:** Se encontraron 2.537 artículos, pero sólo cinco presentaron los criterios de elegibilidad. **Discusión:** Pocos estudios referentes al tema fueron encontrados. De los cinco artículos seleccionados, tres dedujeron no encontrar alteraciones y dos encontraron patrones alterados, relacionando con el factor de obstrucción nasal. Es necesario que más investigaciones se realicen sobre el tema. **Conclusión:** No hay evidencias científicas que afirmen la presencia de alteraciones de masticación y deglución derivadas del asma y de la rinitis en niños y adolescentes.

Palabras claves: Asma; Rinitis; Fonoaudiología.

Introduction

Allergic rhinitis arises from the inflammatory reaction mediated by specific IgE antibodies, being manifested after exposure of the lining mucosa of the nasal cavity to the allergen involved. Clinical manifestations occur most commonly in childhood, although up to 30% of patients may be started later[1,2].

Asthma is the main chronic respiratory disease of children and adolescents, becoming one of the major diseases of childhood. Because it is a potentially serious condition whose prevalence has increased with higher participation in mortality, it becomes relevant both for the individual and for the coletivity[3].

Rhinitis and asthma are chronic diseases that affect the quality of life of individuals who have these conditions. Studies have shown that allergic rhinitis is closely related to asthma[4,5,6]. This relationship occurs in a variable way, depending on the individual himself, his genetic predisposition, the environment that he is exposed to, as well as the season of the year and age[1,7].

In the literature, oral breathing is a symptom that appears very frequently in chronic respiratory diseases, such as rhinitis and asthma, due to nasal obstruction, which leads to changes in facial growth and in structures of the stomatognathic system[8,9]. Therefore, when the patient breathes through the mouth, he tries to supply the deficiency of the breathing air, removing the vestibule-lingual balance, altering the balance of the facial muscles and generating important functional deficiency[10]. Thus, any change in the mode and type of this breathing function may cause impairments in other stomatognathic functions, such as chewing and swallowing[11]. Pathologies such as asthma and rhinitis affect the balance in such a way that their functions are performed inefficiently, causing even more craniofacial changes.

Some studies were conducted in speech therapy with the aim of characterizing this population. In 2009[8], the functional alterations of the stomatognathic system were investigated in patients with allergic rhinitis. The authors affirm that the increase in the intensity of nasal obstruction symptoms is related to the presence of alterations in the functions of the stomatognathic system, such as chewing and swallowing. Other similar studies indicate that the patient with allergic rhinitis presents changes in the functions of chewing, swallowing and breathing, the latter related mainly to nasal obstruction, which is the predominant symptom in this pathology and is directly related to changes in the stomatognathic system[9,8, 12,13].

In addition, it is also possible to suggest that craniofacial, dental and oral functions are characteristics commonly found in patients with oral breathing. Among the oral functions that may be altered, there is swallowing, since these patients tend to present flaccidity and change in the usual position of the orofacial structures due to their inadequate use[14].

Cunha and colleagues[11] characterized the patterns of facial anthropometry and mastication in asthmatic children, emphasizing in the study that asthma can affect facial growth, promoting postural changes of the head and neck, as well as changes in the tongue and position of the mandible, as well as its chronic evolution in the emotional, physical and social life of the child.

These changes affect the quality of life of people diagnosed with rhinitis and asthma. Thus, although there is, according to the literature, a direct relationship between rhinitis and nasal obstruction and of the latter with morphofunctional changes of the stomatognathic system, few studies have observed such alterations in patients with rhinitis and asthma[8;12].

The importance of performing an integrative review in this area is due to the fact that, as speech therapists, we strive to use the best scientific evidence in the treatment of chewing and swallowing disorders[15]. It is necessary to have knowledge of external evidence to construct individual clinical reasoning, thus reflecting the choices for a specific care plan. The meaning of efficient and effective clinical practice in evaluation and rehabilitation entails the duty to use a treatment that has proven therapeutic relevance. Thus, this study aimed to perform an integrative review of changes in chewing and swallowing in children and adolescents with rhinitis and asthma[16].

Methods

The present work is about an integrative review of the scientific literature. This method was chosen because it provides a scientific basis that allows the analysis of chewing and swallowing disorders secondary to rhinitis and asthma, allow-

ing the synthesis of published studies to provide general conclusions regarding an area of study and performing a more complete understanding of the topic.

Initially the question for the development of this study was: "what are the changes in chewing and swallowing in children and adolescents with asthma and rhinitis?". For the elaboration of this research, the tool was already published material on the subject of chewing and swallowing in children and adolescents with asthma and rhinitis. The electronic databases consulted were Lilacs, MedLine, PubMed and Scielo, in which the following keywords described in Chart 1 were used in Portuguese and English. All of those were considered as descriptors registered in the Descriptors in Health Sciences (DECs) and Medical Subject Headings (MESH). The search was limited to articles written in English and Portuguese.

Chart 1. Keywords of search strategies

Rhinitis or asthma and Speech therapy	Rhinitis OR asthma AND speech therapy
Rhinitis or asthma and stomatognathic system	Rhinitis OR asthma AND stomatognathic system
Rhinitis or asthma and swallowing	Rhinitis OR asthma AND deglutition OR swallow
Rhinitis or asthma and chewing	Rhinitis OR asthma AND mastication OR chew

The articles identified by the initial search strategy were evaluated according to the following inclusion criteria: to address changes in chewing and swallowing functions secondary to rhinitis and asthma in children from 0 to 12 years of age and adolescents from 12 to 18 years of age, regardless of the methods' designs. Articles that had repeated or available information in other articles were excluded. No time filter was used.

The searches occurred in January and February 2017, and were updated in June 2018. Initially, articles were searched in the databases with the keywords previously mentioned (Chart 1). 2,537 papers were found, with 1,909 in PubMed, 508 in MedLine, 72 in Lilacs and 48 in Scielo. During the search, most of the articles found were not related to the researched topic.

Therefore, these papers were filtered and selected for the research through the reading of their titles, which approached subjects related to the subject of the present study, totaling 126 articles. Within this number, there were 110 repeated works, which were organized for reading in full by an evaluator, totaling 16 articles.

Classification reading was performed in the entirety of the 16 studies, the only ones that dealt with the alteration of swallowing and / or chewing functions in children and adolescents related to rhinitis and / or asthma, responding to the study questions. Thus, they were included in this review, in the English and Portuguese languages, totalizing, at the end of the research, 5 articles. The remaining 11 articles were excluded, since four of them presented other pathologies not studied at this work, five were not only performed with children and adolescents, one addressed only the speech function of the stomatognathic system and one addressed only the Speech, Language and Hearing Sciences treatment.

Lastly, after the final selection of the researched studies included in the analysis, the main information was compiled. Subsequently, a descriptive analysis of the same was carried out, in order to understand and broaden the knowledge about the theme of the present study.

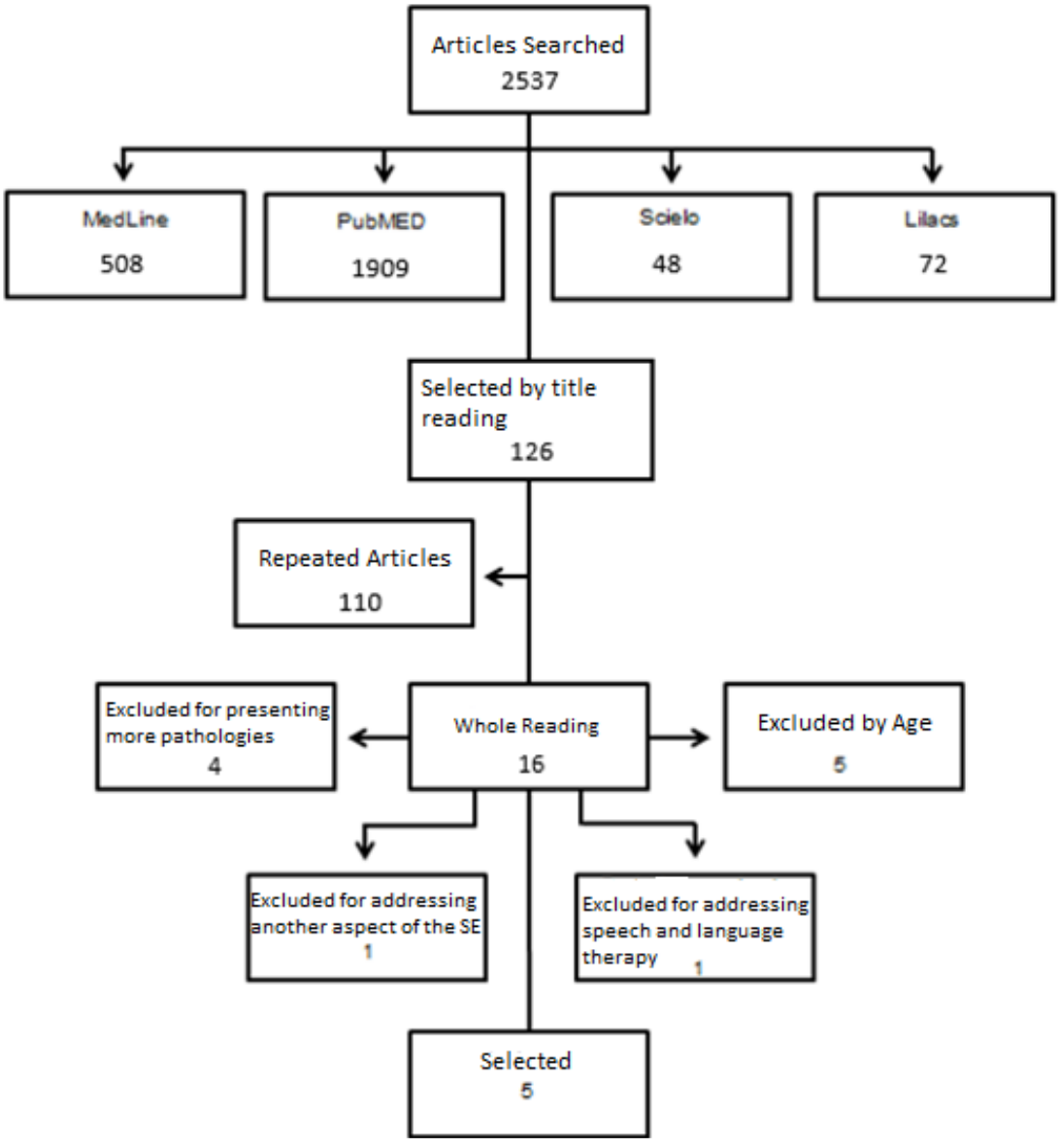

Figure 1. Flow chart representing the number of articles selected and excluded in different databases.

Results

Chart 2 summarizes the scientific papers selected in the present study. The year of publication, authors, type of study, main results and conclusion were described. No articles that addressed the changes in adolescents were found.

Chart 2. Characteristics of studies included

Author/ Year	Study	Design	Objectives	Results	Conclusions
Bezerra, et al. 2014.	Masticatory Changes in Oral Breath Secondary to Allergic Rhinitis: Integrative Review	Integrative Review	To verify the masticatory changes in allergic rhinitis oral breathing children, reuniting the Scientifics subsidies available in literatures	1,986 articles were found, however, only two fit the full inclusion criteria. The two included articles showed significant statistical changes	It is necessary to perform a better controlled study with a bigger sample in order to confirm such changes
Cunha, et al. 2012.	Analysis of the masticatory process in asthmatic children: Electromyographic Clinical Study	Case Study	To verify the clinic and electromyography characteristics related to the process of mastication in asthmatic children and to relate electrical activities of the masseter and anterior temporal	Statistical changes were not evidenced when compared to mastication of asthmatic and non-asthmatic children	Although no significant differences were found, it is stated that the chewing process can suffer changes provoked by this pathology's signs
Castro, et al. 2012.	Evaluation of the Orofacial functions of the stomatognathic system on severity levels of asthma	Cross-Sectional Study	To evaluate the orofacial functions of chewing, swallowing and speech in asthmatic and healthy children	Orofacial functions changes were found, with differences between the three studied groups. Theses changes were not related to asthma severity	Regardless of the severity level of the disease, asthmatic children present altered patterns of chewing, swallowing and speech
Cunha, et al. 2009.	Anthropometry and Chewing in Asthmatic Children	Descriptive, observational and transversal study	To characterize the facial anthropometry patterns, to identify the presence of facial asymmetries and to relate the masticatory predominance with the presence of facial asymmetry in asthmatic and non-asthmatic children	Significant changes were not revealed between asthmatic and non-asthmatic children regarding facial anthropometric, facial asymmetry and chewing patter mensuration	No significant relations were found
Oliveira, et al. 2008.	Study regarding craniofacial alterations in atopic and / or asthmatic children, University Hospital Cassiano Antônio Moraes, Vitória-ES, Brazil	Comparative study	To evaluate the relation between the respiratory impairment in atopic and/or asthmatic children aged from three to six years old and its effects on facial and occlusal characteristics and oronasopharyngeal functions	The application of the test used on the research showed significance for increased overjet, open bite, nasal obstruction, atypical swallowing, phonation and long facial type.	It was evidenced that oral breathing and atopy and/or asthma are positively associated with the development risk of facial, occlusal and oronasopharyngeal changes.

Discussion

Few published studies addressing the issue of the present study were found. Of the five articles selected for research, one is an integrative review[13]. Only this study addressed rhinitis, and no further findings were found regarding this pathology associated with Speech, Language and Hearing Sciences.

In the integrative review study, the authors[13] verified masticatory changes in children with oral breathing caused by the presence of allergic rhinitis. The majority of the articles in this study stated that there was no statistically significant difference in masticatory changes in this population. They concluded that a better-controlled study with a larger sample was necessary to investigate the presence of these alterations.

Another study[17] selected during the research aimed to evaluate the orofacial functions of chewing, swallowing and speech in asthmatic children, at different levels of asthma, and compared with healthy children. In this study, 27 asthmatic children and 27 healthy children were evaluated in the control group. The results show the presence of alterations in the orofacial functions, with differences between the studied groups. These changes were not related to the severity of asthma, since the highest rate of changes was found in the mild asthma group. The authors concluded that asthmatic children present changes in chewing, swallowing and speech functions regardless of the level of asthma severity. The results suggest that asthma determines changes in orofacial functions, regardless of the presence of allergic rhinitis.

Swallowing in oral and nasal breathers was studied by Hennig et al. The authors found, through speech-language and electromyographic evaluation, that oral breathing children presented evident changes in the swallowing function. A study[18] was carried out on chewing in oral breathing children, whose objective was to evaluate the nutritional status, respiratory mode and mastication of nasal and oral breathing children. It was observed that oral breathing children presented changes in the masticatory pattern when compared to nasal breathing children. The presence of noises and escape of food during chewing, both from the respiratory pauses, necessary for the oral breathing individuals, were verified.

Swallowing and chewing were also altered in asthmatic children[17]. Thus, the anatomic and functional imbalance caused by oral breathing may result in changes in the masticatory function, also influencing swallowing, since these functions require several factors acting in an appropriate way. Among these factors, we can mention lip sealing, tonus, and tongue posture, due to the difficulty of oral breathers in maintaining the usual posture of closed lips.

Another study[19] that found changes in the swallowing function aimed to evaluate the relationship between respiratory compromise in atopic and/or asthmatic children aged three to six years old, as well as its effect on facial, occlusal and oronasopharyngeal functions. The study consisted of 33 atopic asthmatic and / or asthmatic children and 49 children in the control group. A statistically significant relation was observed for the vestibulolingual overlapping variables between the upper and lower incisors, open bite, nasal obstruction, atypical swallowing and phonation, in addition to the long facial type.

Therefore, the authors[19] concluded that atopic and / or asthmatic childhood conditions may lead to the development of oral breathing, showing that asthma may be a predisposing factor for the evolution of more severe craniofacial alterations. This study reinforces the connection of oral breathing that occurs due to the presence of nasal obstruction in asthmatic children, causing alterations in the stomatognathic function of deglutition and swallowing.

Cunha and collaborators[11] studied 30 asthmatic children with the aim of characterizing the patterns of facial anthropometry and to relate the side of masticatory predominance compared to non-asthmatic children. In this study, significant differences were observed only for the thirds of the face and for the labial commissures, with the average third of the face being statistically lower than the lower third and the left labial commissure being significantly lower in the asthmatic group.

When the researchers related masticatory predominance and facial asymmetry, they did not find statistically significant differences. Of the asthmatic children assessed that presented facial asymmetry, 16 had a simultaneous bilateral masticatory pattern. At the end of the study, they concluded that no significant differences were found between the control and the asthmatic group, regarding the

anthropometric measurement. On the other hand, facial asymmetry was observed in the two evaluated groups. In both, the simultaneous bilateral masticatory pattern was predominant, but when the relation between facial asymmetry and the masticatory predominance side was not observed, no statistically significant relationships were observed.

Still on the study[11] above, regarding the masticatory pattern found in most of the children of the study - the simultaneous bilateral - it was not possible to affirm that the alteration presents a relation with asthma, since the results indicating alterations were found in both asthma and control groups.

Another study carried out[9] afterwards, in order to verify the clinical and electromyographic characteristics related to the chewing process in asthmatic children, with 30 children diagnosed with asthma and 30 healthy, found that statistical differences were not evidenced when comparing the chewing of asthmatic and non-asthmatic children. Although they observed this fact, the data found in the study showed that asthmatic children may chew in a shorter time, as they present difficulties in maintaining the necessary respiratory balance during the feeding process. They concluded that, although no significant differences were found in the chewing process of these children, mastication may suffer alterations caused by the signs of asthma.

Oliveira and collaborators[19] performed the evaluation of masticatory performance in nasal and oral breathing subjects. The study concluded that the respiratory pattern was not a determining factor in chewing, however, it was considered necessary to carry out future studies to verify, in the long term, if the non-correction of the oral breathing disorder can influence the masticatory performance.

Therefore, it is possible to suggest that the effect of rhinitis and asthma on the functions of swallowing and chewing are only observed later. With the change in the orofacial functions, individuals use muscle and / or postural compensations to perform these functions, such as head movements and kneading of the food with the tongue, which can become alterations more pronounced throughout of time[20,21].

It is also worth mentioning that the mouth breather child or adolescent can present alteration in the smell and taste, thus, causing food preferences regarding consistency and ease of ingestion, avoiding thicker foods. A recent study[22] observed through a literature review that the relation of oral breathing with the modification in the general feeding process, associated with difficulties in smell, taste and orofacial myofunctional disorders, such as chewing, can affect nutritional status and, in some ways, impair development and postural balance. Lastly, the study suggests the possibility of the relationship between smell, taste and changes in stomatognathic functions.

The studies found in the present study were performed by speech therapists, physicians (otorhinolaryngologists and pediatricians), physiotherapists, nutritionists and dentists, but it is worth noting that the absence of interdisciplinarity between Speech, Language and Hearing Sciences and Specialized Medicine is currently perceived. Thus, the objective of conducting clinical team studies with these professionals is necessary for earlier diagnosis, in addition to more effective therapeutic measures[23,24,25]. The studies performed to date observed in this study do not present a robust methodology for the diagnosis of possible alterations.

Conclusion

It was concluded that there is no scientific evidence to support the presence of chewing and swallowing alterations due to asthma and rhinitis in children, and no studies on the subject were found in adolescents.

It was not possible to find in the literature studies on swallowing disorders in children, only with rhinitis. It is probable that there is a relation between these pathologies and the presence of alterations in the orofacial functions. However, it is necessary that further studies be performed.

References

1. Bousquet J, Van Cauwenberge P, Khaltaev N. et al. Allergic rhinitis and its impact on asthma. J Allergy Clin Immunol. 2001; 5 (108): 47-334.

2. Ibiapina C, Sarinho ESC, Camargos PAM, Andrade CR, Filho AASC. Rinite alérgica: aspectos epidemiológicos, diagnósticos e terapêuticos. J Bras Pneumol. 2008; 34 (4): 230-40.

3. Chatkin JM, Barreto SM, Fonseca, NA. et al. Trends in asthma mortality in young people in southern Brazil. Ann Allergy Asthma Immunol. 1999; 82: 287-92.

4. Camargos, PAM, Rodrigues MESM, Solé D, Scheinmann P. Asma e rinite alérgica como expressão de uma única doença: um paradigma em construção. J Pediatr. 2002; 78: 123-28.

5. Cruz AA, et al. Common characteristics of upper and lower airways in rhinitis and asthma: ARIA update, in collaboration with GA2LEN. Allergy. 2007**;** 62:1-41.

6. Caimmi D, Marseglia A, Pieri G, Benzo B, Bosa L, Caimmi S. Nose and lungs: one way, one disease. Italian Jornal Pediatrics. 2012; 38 (60).

7. Global Initiative for Asthma – GINA. Global strategy for asthma management and prevention, 2012. Citado em Outrubro de 2016. Disponível em http://www.ginasthma.org/local/uploads/files/GINA_Report_March13.pdf

8. Lemos CM, Wilhelmsen NSW, Mion OG.; Mello junior JF. Alterações funcionais do sistema estomatognático em pacientes com rinite alérgica: estudo caso-controle. BJORL. 2009; 75 (2): 268-74.

9. Cunha DA, *et al*. Análise do processo mastigatório de crianças asmáticas: Estudo clínico e eletromiográfico. Int. Arch. Otorhinolaryngol. 2012;16 (3): 358-64.

10. Cintra CF, Castro FF.; Cintra PP. As alterações orofaciais apresentadas em pacientes respiradores bucais. Rev Bras Alergia Imunopatol. 2000; 23 (2): 78-83.

11. Cunha DA, et al. Antropometria e mastigação em crianças asmáticas. Revista do Cefac. 2009;11 (3): 341-8.

12. Campanha SM, Freire LMS, Fontes MJF. Impact of asthma, allergic rhinitis and mouth breathing in life quality of children and adolescents. Revista do Cefac. 2008;10 (4): 513-19.

13. Bezerra LA, *et al*. Masticatory Changes in Oral Breath Secondary to Allergic Rhinitis: Integrative Review. Int Arch Otorhinolaryngol. 2014; 18:128-31.

14. Hennig TR, Silva AMT, Busanelo AR, Almeida FL, Berwig LC, Boton LM. Deglutição de respiradores orais e nasais: avaliação clínica fonoaudiológica e eletromiográfica. Revista do Cefac. 2009; 11(4): 618-23.

15. Lima SJH, Pernambuco LA, Lins AL, Albuquerque LCA, Silva HJ. Movimentos mandibulares na fala em crianças com rinite alérgica. CoDAS. 2015; 27(4): 359-64.

16. Chambi-Rocha, A, Cabrera-Domínguez, MA, Domínguez-Reyes, A. Breathing mode influence on craniofacial development and head posture. J Pediatr 2018; 94(2): 123-30.

17. Castro, MSJ, Toro AADC, Sakano E, Ribeiro JD. Avaliação das funções orofaciais do sistema estomatognático nos níveis de gravidade de asma. J Soc Bras Fonoaudiol. 2012; 24 (2): 119-24.

18. Cunha DA, Silva GAP, Motta MEFA, Lima CR, Silva HJ. A respiração oral em crianças e suas repercussões no estado nutricional. Revista do Cefac. 2007; 9(1): 47-54.

19. Oliveira RLB, Noronha WP, Bonjardim LR. Avaliação da performance mastigatória em indivíduos respiradores nasais e orais. Revista do Cefac. 2012; 14 (1): 114-21.

20. Whitaker, ME, Junior AST, Genaro KF. Proposta de protocolo de avaliação clínica da função mastigatória. Revista do Cefac. 2009:11(3): 311-23.

21. Hitosa, SF, Arakakib R, Soléc D, Weckx LLM. Oral breathing and speech disorders in children. J Pediatr. 2013; 89(4): 361−5.

22. Machado PG, Mezzomo CB. A relação da postura corporal, da respiração oral e do estado nutricional em crianças – uma revisão de literatura. Revista do Cefac. 2011; 13 (6): 1109-18.

23. Camelo-nunes IC, Solé D. Rinite alérgica: indicadores de qualidade de vida. J Bras Pneumol. 2010: 36 (1): 124-33.

24. Branco A, Ferrari GF, Weber SAT. Alterações orofaciais em doenças alérgicas de vias aéreas. Rev Paul Pediatr. 2007; 25 (2): 266-70.

25. Carvalho-Oliveira M, Salles C, Terse R, Júnior, A. Associação entre asma grave e alterações do sistema estomatognático. J Bras Pneumol. 2016; 42(6): 423-28.