

# Masticatory Changes in Oral Breath Secondary to Allergic Rhinitis: Integrative Review

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Int Arch Otorhinolaryngol 2014;18:128–131.

## Abstract

**Introduction** The III Brazilian Consensus on Rhinitis (2012) defines allergic rhinitis as a nasal mucosa inflammation, mediated by immunoglobulin E, after exposure to allergens. The classic signs and symptoms of allergic rhinitis are nasal obstruction, watery rhinorrhea, sneezing, and nasal itching, often reversible either spontaneously or with treatment, and mouth breathing (breathing predominantly through the mouth, regardless of the cause, due to a nasal breathing impairment) in some cases.

**Objective** To evaluate the literature on masticatory changes in children with mouth breathing due to allergic rhinitis.

**Methods** We conducted a search of the past 10 years, at Bireme and MEDLINE databases, for articles that covered masticatory changes in children with mouth breathing secondary to allergic rhinitis.

**Results** We found 1,986 articles, including 15 repeated in databases, but only two articles met the inclusion criteria fully.

**Discussion** We found few studies to answer the question raised in this review, and those studies have some methodological limitations. Most articles claimed no have statistically significant differences in masticatory changes in this population.

**Conclusion** A better controlled study (isolating diseases, exposure time), with a larger sample (sample calculation appropriate), would be necessary to examine such changes.

## Keywords

- ▶ mastication
- ▶ rhinitis
- ▶ allergic
- ▶ seasonal
- ▶ mouth breathing

## Introduction

The III Brazilian Consensus on Rhinitis (2012) defines allergic rhinitis as an nasal mucosa inflammation, mediated by

immunoglobulin E, after exposure to allergens.<sup>1</sup> According to ARIA (Allergic Rhinitis and Its Impact on Asthma) initiative recommendation, allergic rhinitis can be classified

received  
 June 15, 2013  
 accepted  
 July 7, 2013

DOI <http://dx.doi.org/10.1055/s-0033-1358585>.  
 ISSN 1809-9777.

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**Table 1** Intersections in Portuguese, English, and Spanish idioms

Mastication AND Mouth Breathing	Mastigação AND Rinite Alérgica	Masticación AND Respiración por la boca
Mastication AND Allergic Rhinitis	Rinite Alérgica AND Respiração Oral OR Respirador Bucal OR Respirador OR Respiração Bucal	Mastigação AND Respiração Oral OR Respirador Bucal OR Respirador OR Respiração Bucal
Mouth Breathing AND Allergic Rhinitis	La Rinitis Alérgica AND Masticación	La Rinitis Alérgica AND Respiración por la boca
	Masticación AND Boca des Respiradero	La RinitisAlérgica AND Boca des Respiradero

considering the duration (intermittent, persistent) and severity (mild, moderate, and severe) of the symptoms, quality of life aspects, and frequency that the allergic rhinitis arises (seasonal, perennial, circumstantial, and occupational).<sup>1</sup> The classic signs and symptoms of allergic rhinitis are nasal obstruction, watery rhinorrhea, sneezing, and nasal itching, often reversible either spontaneously or with treatment, and mouth breathing (breathing predominantly through the mouth, regardless of the cause, due to a nasal breathing impairment) in some cases.<sup>1-4</sup> This causes myofunctional imbalances and changes in stomatognathic functions and at the body axis.<sup>5</sup> Several physical characteristics are observed in this population because of oral respiratory habits, such as craniofacial changes (vertical rise of the lower third of the face, dental malocclusion, jaw elevator muscles hypotonia, changes in tongue rest posture) and oral functions changes (swallowing, speech, voice, chewing).<sup>1-7</sup>

In individuals with allergic rhinitis, mouth breathing commonly causes evident changes in chewing, which can lead to muscle compensation suggesting a masticatory preference side, creating a muscle misalignment. So, knowledge about masticatory changes is necessary to better prevent more serious maladjustment.

This integrative literature review was developed with the objective to verify the masticatory changes in children with mouth breathing due to allergic rhinitis by gathering scientific subsidies available in the literature.

## Methods

Initially the research question formulated was: What are the masticatory changes in children with mouth breathing secondary to allergic rhinitis? A search was conducted of publications in the past 10 years in Bireme (search engines LILACS, MEDLINE, SciELOBr) and MEDLINE (PubMed search engine) databases for articles that covered masticatory changes in children with mouth breathing secondary to allergic rhinitis.

We used the following keywords: *Mastication* and *Mouth Breathing* as DeCS/MeSH terms, *Allergic Rhinitis* as free term/MeSH, and *Mouth Breathing* and *Oral Breathing* as free terms, in Portuguese, English, and Spanish idioms. The crosses with these words were made using the Boolean operator *AND*, without limitation language, and are shown in ►Table 1.

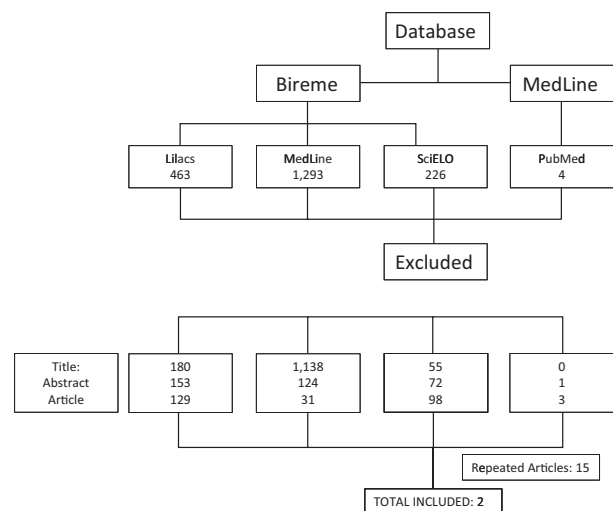
The inclusion criterion for this review was an approach to the masticatory in allergic rhinitis. First, original scientific articles were included that approached masticatory changes in children and adolescents with mouth breathing secondary to allergic rhinitis in its title. Then, these articles were analyzed by reading their abstracts, conducted by the three examiners; only those articles that approached masticatory changes in children and adolescents with mouth breathing secondary to allergic rhinitis were later included in the review. We excluded articles that did not approach masticatory changes in this population, review articles, and a single case study.

The articles were read in their entirety, excluding those that did not fit the inclusion criteria. No article was deleted due to idioms.

## Results

►Fig. 1 shows the flowchart of the articles number in this review by intersections as described in ►Table 1.

The end result of this review is found in ►Table 2.



**Fig. 1** Flowchart representing the number of articles found, deleted, and selected for this review.

Table 2 The end result found on this review

Author	Year	Local	Objective	Sample	Method	Results
Lemos et al <sup>8</sup>	2007	Sao Paulo, Brazil	To verify the breathing and masticatory function changes and swallowing in patients with allergic rhinitis in different age groups and relate the changes to the rhinitis symptom intensity	85 patients with allergic rhinitis, of both genders, age 4–60 y, attended in Division Allergy Group of Clinical Otorhinolaryngology of the Clinics Hospital, Medicine Faculty, Universidade de São Paulo. Subdivision into 3 groups: group 1 (4–11 y), group 2 (12–18 y), and group 3 (19–60 y). Likelihood ratio test was used to detect differences in the distribution of the variables of each function between groups. The Kruskal-Wallis test was used to observe a statistically significant difference between groups.	Patients evaluated by an otolaryngologist and a speech therapist	Higher frequency of nasal obstruction absence in group 1; higher frequency of nasal obstruction in group 2. Normal swallowing in 20% in group 1, 23.3% in group 2, and 20% in group 3. High frequency of open-mouth masticatory pattern with kneading in group 1 and a statistically significant difference in this group to feed pasty consistency. Increased nasal obstruction scores and intensity of changes in breathing and masticatory functions showed a significant correlation.
Lemos et al <sup>9</sup>	2009	Sao Paulo, Brazil	To verify the presence of changes in: breathing, masticatory, swallowing, and speech functions in patients with allergic rhinitis and associate the changes with the rhinitis symptom intensity	170 patients divided into 2 groups: rhinitis group (GR) with 85 patients, and control group (CG) with 85 patients. Both groups were subdivided into 3 further groups: G1 (children, n = 30 in each), G2 (adolescents, n = 30 in each), and G3 (adults, n = 25 in each).	Ear, nose, and throat evaluation; speech therapist evaluation observing the breathing mode (classified as normal or abnormal), masticatory function (normal when made with the lips closed or bilaterally or abnormal), the swallowing pattern (also classified as normal or altered), and articulation standard (being normal or abnormal). Student <i>t</i> test was used to verify similar age, the likelihood ratio test was used to compare the scores of the ear, nose, and throat evaluation between GR and CG; for the other outcomes, the same test was used in different age groups to verify the difference in the variables of each function distribution; Mann-Whitney was used to verify the correlation between the obstruction score and the presence of functional changes.	7.6 years of average age to G1 GR, and 7.3 years for G1 GC. Breathing mode was changed in 83.3% of G1 GR and normal in 86.7% of the G1 GC. Masticatory standard: changes in 40% of G1 GR and normal in 100% of the G1 GC. Correlation between obstruction scores and functional changes was significant for the breathing mode and masticatory standard.

## Discussion

We found few published studies addressing the question raised in this review, and those studies had methodological limitations. The two selected articles have the same authors and demonstrated a difference in masticatory function<sup>8,9</sup> in this population with allergic rhinitis when study subjects were compared with healthy subjects and/or to the literature.

Both articles suggested changes in relation to labial closure during chewing function, but one article reports only chewing with open mouth and the preference for soft foods,<sup>8</sup> and the other article does not define whether the changes found in chewing refer only to absence of labial closure and/or without bilateral mastication.<sup>9</sup>

Although knowledge of the likely craniofacial changes resulting from mouth breathing are already well defined, and it is known that these changes bring masticatory changes,<sup>10-12</sup> we know the changes are not just due to the act of chewing with the mouth open and/or bilateral mastication.

Other studies with masticatory changes due to mouth breathing showed that this habit constantly keeps the mouth open, preventing the tongue from pressing the palate; then the hard palate tends to rise and begins to present distocclusion and cross-bites.<sup>13</sup> All this further stimulates the individual to breathe through the mouth.

Lima et al, in their 2006 study with 26 children ~5 to 7 years old, evaluated chewing by filming mastication of a 50-g piece of French bread.<sup>14</sup> They concluded that the mastication of most of the children (76.9%) occurred with labial closure and did not present kneading chewing. Regarding the chewing pattern, the majority of the children showed a bilateral alternated mastication pattern (10 children), bilateral with only vertical movements and right unilateral (with 6 children in each), and unilateral predominance of the left side (4 children).<sup>14</sup>

Silva et al investigated the likely changes caused by mouth breathing in masticatory function by studying 46 children (23 nasal breathing and 23 mouth breathing).<sup>15</sup> Mastication was evaluated through filming, but the kind of food used was not described; they used the same food for the entire sample. The authors found that mouth-breathing children presented vertical movements associated with rotational jaw movements, and no vertical movements were seen in the nasal-breathing group. Regarding the mastication time, the authors observed a statistically significant difference when comparing the average time between the groups, concluding that the mastication time in the mouth-breathing group was lower than in the nasal-breathing group.<sup>15</sup>

The two Lemos et al (2007 and 2009) articles claimed that nasal obstruction was directly related to masticatory changes in function and breathing mode and that probably the time of exposure of the nasal obstruction by the allergic rhinitis negatively interfered with child development.<sup>8,9</sup>

## Conclusion

We could not find in this integrative review studies that assessed chewing performance in depth in children with

mouth breathing secondary to allergic rhinitis. The few articles found did not stop these changes.

According to the articles evaluated and discussed, it can be concluded that there are statistically significant changes in mastication in a child with mouth breathing secondary to allergic rhinitis when compared with children without allergic rhinitis with nasal breathing. However, it is necessary to conduct a better-controlled study (isolating diseases and exposure time) with a larger sample (appropriate sample calculation) to assert such changes.

So far, none of the articles surveyed and/or evaluated in this review approached the masticatory preference side, including mastication time or other likely changes of masticatory function in this population.

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