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The Influence of Allergic Rhinitis Treatment on Asthma

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Abstract

Background: Rhinopathy, a dysfunction or inflammation of the nasal mucosal lining, presents with symptoms of nasal obstruction, posterior and anterior rhinorrhea, sneezing, nasal itching, and hyposmia, with variations in symptom intensity in each subtype. Asthma originates from a combination of genetic and environmental factors. **Objective:** This study aimed to treat allergic rhinitis in patients with controlled asthma and to verify the behavior of the variables. **Methods:** In this prospective study, quantitative and qualitative assessment of rhinopathy in asthma was performed. Patients with symptoms of rhinopathy and controlled asthma, who were controlled with treatment at the pulmonology outpatient clinic of the Center for Medical Specialties at [hospital], were included. Patients were treated for 2 months according to the IV Rhinopathy Consensus. They underwent a pulmonary function test and completed a questionnaire before and after treatment for rhinopathy. **Results:** In total, 47 patients aged 7 - 12 years (9.30 ± 1.70 years; median 9 years) were evaluated, including 29 (61.7%) males and 18 (38.3%) females. Patients were evaluated at two timepoints, with an interval of 12 days to 14 months (3.81 ± 3.21 months; median 3 months), and were evaluated regarding the various characteristics of their allergy. **Conclusion:** The treatment of allergic rhinitis in patients with asthma resulted in an improvement in variables related to nasal congestion, rhinorrhea, cough, dyspnea, wheezing, and dyspnea on exertion, and maintaining physical activities without dyspnea.

Keywords

Rhinopathy, Allergic Rhinitis, Asthma, Children, Prospective, Questionnaire, Pulmonary Function Test, Quantitative Variables, Qualitative Variables, Environmental Factors

1. Introduction

Although the nose is an apparently simple organ, it comprises a complex structure that humidifies, heats, and filters the inspired air. Several causes, including rhinopathies, nasal septum deviation, adenoid hypertrophy, nasal polyps, and tumors, can impair nasal function. Rhinopathy is one of the main causes attributed to changes in nasal function.

The 2017 Consensus on Rhinopathy and the European Academy of Allergy and Immunology [1] [2] classify rhinopathy into non-allergic and non-infectious, mixed, or allergic rhinopathy based on the main etiology. We focus only on allergic rhinopathy based on its association and influence on asthma. The frequency of allergic rhinitis in Brazil was assessed using the Protocol of the International Study of Asthma and Allergies in Childhood (ISAAC) in population studies in schoolchildren and adolescents; the prevalence of allergic rhinopathy was 12.8% - 18%. An association between rhinopathy and asthma has long been suspected. The ARIA Symposium Report (Allergic Rhinitis), published in 1999, described the impact of allergic rhinitis on asthma. Asthma, like allergic rhinopathy, originates from a combination of genetic and environmental factors. The most common asthma triggers include allergens (house dust mites, cockroaches, pollen, animal fur, fungi, etc.), environmental factors (active and passive smoking, air pollution, chemical irritants, etc.), and physical exercise.

The research was developed based on the literature in which treating patients with allergic rhinopathy we have better control of the asthma. This study seeks to identify which are these improvement factors for both clinical symptoms and external factors that can worsen or improve the asthmatic patient through treatment clinic for allergic rhinopathy.

2. Influence of Allergic Rhinopathy on Asthma

2.1. Allergic Rhinopathy

Rhinopathy, a dysfunction or inflammation of the nasal mucosal lining, is the main cause of altered nasal functions and presents with symptoms of nasal obstruction, posterior and anterior rhinorrhea, sneezing, nasal itching and hyposmia, with variations in the intensity of symptoms. Based on the main etiologic agent, the consensus statement of the European Academy of Allergy and Immunology classifies rhinopathies as follows: 1) infectious, acute, self-limiting, and caused mainly by viruses and less frequently by bacteria; 2) non-allergic and non-infectious, in a group of heterogeneous patients without systemic signs of infection or allergic inflammation (e.g., idiopathic, irritative, non-allergic eosinophilic, nasal polyposis, occupational, sensitive to acetylsalicylic acid, gestational, hormonal, medication-induced, rhinopathy in the elderly, gustatory, cold, ciliary dyskinesia, cystic fibrosis, Wegener's granulomatosis, midline granuloma and tumors); 3) mixed, comprising two or more subtypes of rhinopathy, with or without a known etiologic agent; and 4) allergic, which is most commonly induced by inhalation of allergens in sensitized individuals.

In this study, we highlight the association of allergic rhinopathy with asthma. The epidemiological magnitude of this comorbidity and its repercussions are irrefutable. For example, in a population-based study of 3083 Brazilian adolescents aged 13 to 14 years, the prevalence of allergic rhinopathy was approximately 10%, and approximately 50% of the patients with asthma had allergic rhinitis.

Allergic rhinopathy involves a predominantly eosinophilic inflammation of the nasal mucosa and paranasal sinuses attributed to an immunoglobulin E (IgE)-mediated reaction. Allergic rhinopathies are classically divided into a seasonal subtype, when symptoms are present only at a certain time of year and are related to seasonal antigens (e.g., pollen), or a perennial subtype, where symptoms last longer and are related to perennial antigens (e.g., mites).

2.1.1. Symptoms of Allergic Rhinitis

Allergic rhinitis can be intermittent, wherein symptoms are present for less than 4 days a week or for less than 4 weeks a year, or persistent, where symptoms are present for more than 4 days a week and for more than 4 weeks per year. Furthermore, allergic rhinitis can be classified based on symptom intensity into mild and moderate/severe subtypes based on whether none or more than one, respectively, of the following aspects are present: sleep disorder, impact on daily activities, leisure or sports, impact at school or at work, and the present influencing symptoms.

Endotype-based classification is another approach to classify allergic rhinopathy considering the expression of factors in the immunological response mediated by mast cells, eosinophils, group 2 innate lymphoid cells (ILC2), specific IgE, and interleukin (IL)-4, IL-5, and IL-13 [3] [4]. In the cities in the south and southeast, the highest prevalence of nasal symptoms is during the coldest months of the year. However, in northeastern cities, there is no change in the prevalence of nasal symptoms regardless of seasonal changes throughout the year. The persistent form, which occurs in 20% of cases, is the main type responsible for allergic rhinopathies.

Nasal obstruction, a frequent complaint, may be intermittent or persistent and could vary according to the nasal cycle. Persistent minimal inflammation is a highly relevant characteristic in persistent allergic rhinitis; even asymptomatic patients have basal inflammation of the nasal mucosa characterized by the expression of adhesion molecules and some mediators or other inflammatory markers. However, such patients experience a rapid, intense nasal response when exposed to sensitizing allergens.

Furthermore, a neural response exists beyond the autonomic regulation of glandular secretion and nasal vascular tone that is non-cholinergically and non-adrenergically regulated and involves the peptidergic nerves. Thus, the allergic reaction involves immediate and delayed responses in addition to the neural involvement.

2.1.2. Diagnosis of Allergic Rhinitis

Allergic rhinopathy is diagnosed based on clinical history, personal and family history of atopy, physical examination, and laboratory tests. The clinical diagnosis depends on the presence of sneezing, intense nasal itching, rhinorrhea, and nasal obstruction. Possible identification of the allergen can be conducted through skin test and immediate hypersensitivity or specific IgE in the blood. Standardized nasal cytology can facilitate the differential diagnosis of eosinophilic or non-eosinophilic rhinitis, and allergic rhinopathy is diagnosed based on a positive result for eosinophilia [5].

2.1.3. Rhinopathy Treatment

The treatment of allergic rhinitis is based on three pillars. The first is environmental hygiene; when this is not enough to control nasal symptoms, then drug treatment is necessary. This can be symptomatic treatment through antihistamines or decongestants, or preventive treatment through disodium cromoglycate, antileukotriene, or topical nasal corticosteroids. In selected cases, immunotherapy with allergens can be initiated [6] [7].

In the case of topical nasal corticosteroids, the following may be prescribed:

1) Budesonide: intermediate half-life, low systemic potency, bioavailability of approximately 32%;

2) Fluticasone propionate: long half-life, high systemic potency, bioavailability less than 1%;

3) Fluticasone furoate: bioavailability less than 0.5, similar to propionate [7] [8];

4) Mometasone furoate: bioavailability of less than 0.1% and similar to propionate and fluticasone furoate [4].

In this study, 64 μg budesonid and fluticasone furoate were used every 12 h for 60 days, based on availability.

2.2. Asthma

An interrelationship between rhinopathy and asthma has long been suspected. The ARIA Symposium Report (Allergic Rhinitis and its Impact on Asthma) was published in 1999. Several hypotheses have been proposed and, more recently, theories such as allergic rhinitis as a risk factor for asthma, evaluating patients with rhinitis for asthma since most patients with asthma have rhinitis, and a combined treatment strategy for the entire airway, have been included.

Asthma is a chronic inflammatory disease of the airways. Inflamed airways, when exposed to various stimuli or triggering factors, become hyperreactive, obstructed, and subsequently limit airflow through bronchoconstriction, increased mucus production, and increased inflammation [8] [9].

The most common symptoms include recurrent wheezing, cough that worsens at night, chest tightness, and dyspnea. Both asthma and allergic rhinopathy have a multifactorial genetic and environmental etiology [10] [11]. The most common triggers include allergens, environmental factors, and physical exercise.

Asthma is diagnosed based on case history, clinical examination, and, whenever possible, pulmonary function tests and allergy assessment Clinical diagnosis is based on one or more of the symptoms mentioned, mainly at night or in the early hours of the morning, episodic symptoms; spontaneous or treatment-based improvement (bronchodilators, anti-inflammatory drugs and steroids); and three or more episodes of wheezing in the last year, seasonal variability of symptoms with a positive family history of asthma or atopy, and exclusion of alternative diagnoses. Pulmonary function tests or spirometry can help determine the severity of airflow limitation, potential reversibility, and variability.

Treatment

Initial maintenance treatment for intermittent asthma includes inhaled short-acting beta-2 agonists. In mild persistent asthma, short-term, short-duration beta-2 agonists for symptom relief and maintenance anti-inflammatory therapy (first-line low-dose inhaled corticosteroid [IC]) are initiated; alternatives include anti-leukotrienes or disodium cromoglycate, especially in children. For moderate persistent asthma, a short-acting inhaled beta-2 agonist is used to relieve symptoms, and a moderate-to-high-dose IC (especially in children) or low-to-moderate dose IC with a long-acting beta-2 agonist is used for maintenance. A low-to-moderate-dose IC with antileukotrienes or theophylline may also be used. Oral corticosteroids may be necessary during severe exacerbations. A high-dose IC is used for symptom relief for severe persistent asthma, especially in children, with a high-dose IC and a long-acting beta-2 agonist for maintenance. Antileukotrienes or theophylline are indicated, and oral corticosteroids may be used at the lowest dose for controlling symptoms and/or exacerbations. In refractory asthma, monoclonal anti-IgE antibody treatment should be considered [12].

In all cases, environmental control should be promoted with asthma education for patients and caregivers. A greater impact on clinical variables is observed in patients of asthma with allergic rhinitis.

3. Methods

The research methodology included both quantitative and qualitative components. The quantitative assessment evaluated numerical proportions from data collected through questionnaires based on samples, inclusion and exclusion criteria, and statistical analysis. In addition, qualitative research analyzed the interaction of variables in rhinopathy based on their influence on asthma and related facts. Ludke and André confirmed this research approach by stating that "qualitative methods show that the main concern is to understand the studied object as unique, and that it represents a singular, multidimensional and historically situated reality".

Study Design

This prospective study included patients aged 7 - 12 years with symptoms of allergic rhinopathy without prior treatment for 6 months who were being treated

for asthma at the pulmonology clinic of the Center for Medical Specialties. Examinations and clinical symptoms were used for the confirmatory diagnosis. Parents or guardians provided written informed consent after being informed of the procedures and purpose of the study. Questionnaires were completed and pulmonary function tests were conducted before and after treatment, respectively, for all patients.

This study was approved by Platform Brazil (3,310,383).

4. Results

In total, 47 patients aged 7 - 12 years (9.30 ± 1.70 years; median 9 years) were evaluated, including 29 (61.7%) males and 18 (38.3%) females. Patients were evaluated at two times, with an interval of 12 days to 14 months (3.81 ± 3.21 months; median 3 months). Patients were asked about the various characteristics of their allergy. After the intervention, there was a significant decrease in the percentage of cases that presented difficulty in performing activities due to allergy, nocturnal awakening due to allergy, symptoms upon waking up, use of medication owing to aggravation of allergy, medical appointments for aggravation of allergy, worsening of the condition with seasonal climate changes, and cough, nasal congestion, dyspnea, wheezing, and rhinorrhea during physical activity;. There was no significant change between the pre- and post-intervention periods in environmental variables, including the presence of smokers, pets, or rugs at home. With The most prevalent symptom of rhinopathy are represented in the graphics (Figure 1), the most prevalent symptoms of asthma (Figure 2) and table (Table 1) where all variables are demonstrated.

The mothers or guardians of the participants with asthma reported that their children stopped waking up at night, with a decrease from 17 to 6, indicating a likely improvement in sleep in 11 patients.

Most prevalent symptoms in allergic rhinopathy nasal obstruction and coryza pre-treatment and post-treatment moment

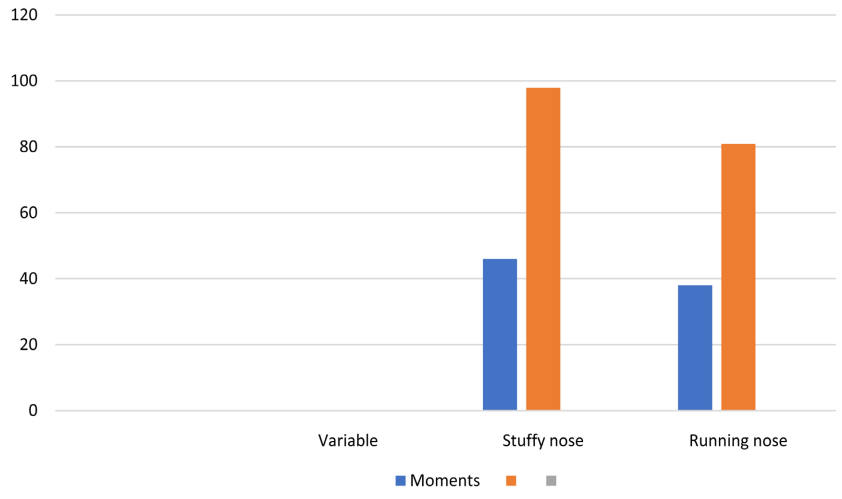

Figure 1. Most prevalent symptoms in allergic rhinopathy.

Most prevalent symptoms in asthma such as coughing, shortness of breath and whezing in the chest before and after treatment.

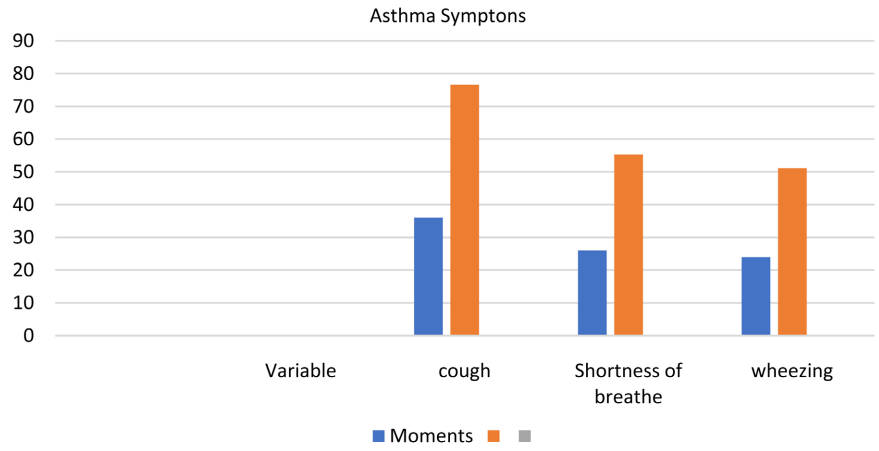

Figure 2. Most prevalent symptoms in asthma.

Table 1. Table with all variables.

Variable	Time				P*
	Pre		Pos		
	n	%	n	%	
have a cough	36	76.6	19	40.4	<0.001
Has a clogged nose	46	97.9	19	40.4	<0.001
Is out of air	26	55.3	10	21.3	<0.001
has wheezing in the chest	24	51.1	9	19.2	<0.001
has a runny nose	38	80.9	18	38.3	<0.001
have a cough, wheezing or shortness of breath when doing physical activities	25	53.2	9	19.2	<0.001
have you felt tired or had difficulty doing your activities because of your allergy	24	51.1	7	14.9	<0.001
have you felt tired or had difficulty doing your activities because of your allergy	17	36.2	6	13.0	<0.001
have symptoms when waking up	24	51.1	10	21.3	0.002
had to take other medications due to worsening of her allergy, asthma or rhinopathy	37	78.7	13	27.7	<0.001
had to go to the doctor because of worsening of her allergy, asthma or rhinopathy	34	72.3	13	27.7	<0.001
there are smokers at home	11	23.4	8	17.0	0.083
have carpet at home	10	21.3	10	21.3	1.000
have pets at home	19	40.4	18	38.3	0.655
gets worse with the change of weather	45	95.7	37	78.7	0.011

(*) McNemar's non-parametric test descriptive probability level.

5. Conclusion

Allergic rhinitis treatment in patients with asthma demonstrated an improvement in the study-related variables. Rhinitis manifestations should be evaluated in patients with asthma. If neglected, rhinitis could make asthma management difficult and limit the benefits of treatment for the patient.

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Data Availability Statement

Data will be shared with others upon reasonable request.

Conflicts of Interest

There are no conflicts of interest to declare.

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